The Builder.

No. CXXIV.

*SATURDAY, JUNE* 21, 1845.

LAST week we examined the report recently made to her Majesty by Sir Henry De la Beche and Mr. Thomas Cubitt, chiefly so far as it related to the fall of the mill at Oldham, appending thereto, some general suggestions of great practical importance with which the report concluded. Relative to the former, however, we omitted one remark which should not be passed over; and that relates to the far too common custom of placing the boilers of steam-engines within the factories themselves, rooms filled with the workers being above them.

The Commissioners say justly, they consider this mode of placing the boilers (adopted chiefly to make the most of the space), very objectionable, remembering the accidents which have happened in such cases through the carelessness of the engine-man, or from imperfections in the boilers or the pipes connected with them. "Where the boilers so placed are near the street, as was observed to be the case in a factory now erecting in Manchester, the danger of loss of life is increased, since accidents from explosion may not only cause the death of those employed in the factories, but of those passing in the street. This is a point to which we would earnestly request attention when Building Acts may be under the attention of the legislature."

Mr. Hodgkinson, in his evidence, pointed out several instances in point wherein considerable loss of life was caused.

We proceed to extract that part of the report which refers to the failure of the part of the prison at Northleach. It appears that an addition having been considered desirable for the purpose of containing six prisoners, a plan for a small building was prepared by Mr. Fulljames, the county surveyor for Gloucestershire, and a contract to execute the works was entered into by Mr. Thomas Haines, of Cheltenham:—

"The building was to have been 28 feet long, 25 feet wide, and 22 feet high, divided into six cells, 13 feet by 7 feet, having stone walls, with brick arches for ceilings. The arches covering the lower cells were 4½ inches thick, rising 10 inches in a width of 7 feet. The upper arches were 9 inches thick with the same rise. The height of the cells on the ground floor to the crown of the arch was 9 feet 3 inches, and in the upper floor 9 feet.

The building was commenced in the middle of May 1844, and carried on until the accident on the 13th of November, when the whole had so far advanced, that the upper arches were finished, and a covering of concrete laid upon them.

According to the evidence of Mr. Pugh, clerk of the works, the lower arches were finished when the building was up one story, and the upper arches were constructed when the walls were sufficiently high, which was about the 7th of September. The arches were built with mortar.

There were no ties or braces across the arches of the lower story, but two iron ties, each divided into three portions, crossed the upper arches, so as to divide their length into three equal portions. These ties were fastened to the side walls, and those dividing the cells, by means of iron plugs sunk into large stones, and secured into them by lead, the plugs coming through eyes or holes at the end of each portion of the ties. The ties were placed above the arches. The arches are described as having been put in during good weather, but subsequently much rain prevailed and soaked through the concrete above the arches and through the latter, so that the whole was in a wet state.

A crack was observed on the north-east corner of the building, at the latter end of October, and this was watched. It would appear that at the beginning of November the arrangements for tying the upper arches were considered, under all the circumstances of the case, insufficient; for orders were given to insert other ties which should connect the side walls through the springing of the upper arches. It was while John Aust, a mason, was employed making a scaffold for preparing holes to pass braces or ties across the building on the 13th of November, that he considered the arch above him unsafe, and before he went to his breakfast he marked it, to see if it were settling. On his return, he saw that the arch had sunk a quarter or half an inch, and of this he apprized the clerk of the works, who called off the men from their labour. This was scarcely accomplished before the six arches fell, and fortunately without injury to those employed on the building.

We attribute the fall of this small addition to the House of Correction at Northleach partly to the insufficient arrangement of the iron ties, placed too high for the strain, and partly to the want of protection of the building from the long continuance of wet weather, the rain having softened and partially washed out a portion of the mortar of the arches. From these circumstances, and the wet and unconsolidated state of the walls, there was no sufficient cohesion of parts to resist the general pressure, the walls were forced so far out as to permit the upper arches, with their load of unconsolidated concrete, to fall on the lower arches, and these readily giving way, the six arches were destroyed, leaving the walls in a damaged state. But for the effect of the rain the arches would probably not have fallen."

It is due to the architect to state, as it appears in evidence, that the contractor was bound to protect the building from the weather, and that the ties were not placed at the spring of the arch because they would then have appeared in the cells, which was highly objectionable.

The erection of fire-proof buildings, by means of iron-girders and brick arches, is becoming general, especially in Manchester and Liverpool, and it is of the utmost consequence that sound information on the subject should be disseminated. "The increase of fire-proof buildings at Manchester," says Mr. Fairbairn, "has been steadily progressive in this district for the last thirty years, and I have no doubt, as the security and durability of these structures are better understood, that a much greater increase will take place; and that eventually every description of public building, and probably dwelling-houses may be constructed fire-proof.

At Liverpool, they have commenced building the warehouses fire-proof, and I can see no reason why the principle should not be extended to almost every description of building, particularly public edifices, such as the Houses of Parliament, Royal Exchange, &c., which, in my opinion, should have been constructed with cast-iron beams and arches, and *made perfectly secure from fire.*

Generally speaking, I am averse to legislative interference with the industrial resources of the country, but in cases such as cotton mills, and large public buildings, wherein numbers of people are congregated, the utmost caution should be observed in the structure, and probably it might add to the public safety as well as the security of property, if some controlling power was at hand, to advise and correct mistakes, in which the most perfect and well meaning are sometimes involved.

The greatest danger, however, arises, not from any desire to save expense, but from fancied security in people trusting either to their own knowledge of subjects they do not understand, or, what is still worse, to the gross ignorance of mere pretenders, whose position and opportunities for information precludes their advancement in either theoretical or practical science.

A knowledge of the strength of materials, and particularly of cast-iron, is but imperfectly understood; it is a subject which requires great labour and deep research, and even with those who have devoted the greater part of their lives and fortunes to these inquiries, it not unfrequently happens, that their labours are not always appreciated by those whom they are intended to serve; when I use the word appreciate, it is not in the sense that individuals and the public are indifferent to the value of such discoveries; but the force of prejudice, and attachment to preconceived notions, which in many cases are absolute imperfections, induce many to forego considerations of this kind, and to shut their eyes against demonstrative truths, calculated on the one hand to save considerable outlay in the cost of material, and what is of much greater importance, the security of life and property on the other."

As respected the arrangement of columns, beams, and tie-rods, it was impossible to lay down rules which would provide for every contingency. Mr. Fairbairn observed "that in fire-proof buildings for manufactories, the sectional area of the tie-rods should not be less than three square inches for every 20 feet in the width of the mill, and for warehouses and similar buildings five square inches will be a fair average proportion.

The walls should, in my opinion, never terminate with less than two bricks thick on the top story, and for every two floors downwards the increase should be an additional half brick, including an extra thickness of 4½ inches in the walls of the ground floor. For factory purposes the above proportions will be quite sufficient, but for warehouses and other buildings calculated to sustain heavy weights, an additional half brick in thickness to every story, terminating at the top with two bricks as before, will insure perfect safety. With these proportions, care must, however, be taken to flush or grout the walls; using at the same time the proper bond, and spreading the base of the foundations to at least one and a half times the thickness of the walls in the bottom story."

To shew the importance of scientific knowledge, it will be sufficient to mention, that a beam with a single flanch at the bottom thus ⊥, which will support a weight equal say to 1,000, may be broken if reversed and the flanch put upwards, thus ⊤, with a weight equal to 340.

"It is well known, or it ought to be known, to every person giving instructions for the form and construction of iron beams, that the strength is nearly a proportional of the section of the bottom rib or flanch; and, according to Mr. Hodgkinson's experiments, a bottom flanch of double the size will give nearly double the strength.

These facts having been proved by direct experiment, it is important to all those concerned in the construction of fire-proof buildings, in which the lives of the public and the property of individuals are at stake, that the form of beams and the section of greatest strength should be *perfectly and thoroughly understood*; and, to those unacquainted with the subject, we would beg to refer them to Mr. Hodgkinson's paper on the strength of iron beams, in the fifth volume, second series of the 'Memoirs of the Literary and Philosophical Society of Manchester.'"

In every description of arch supported by iron beams, it is essential to have the tie-rods as low as possible; it is generally inconvenient to have them in the line of the chord of the arch, or at the bottom flanch of the beam, but they should never be higher than the soffit of the arch.

The strength of cast-iron columns is very little understood by builders; they use them of certain dimensions, because they have been used before of that size and have not failed; the difference in their strength which is found

when one end is rounded instead of flat, or when a column is not *exactly* perpendicular, with many other points of the greatest consequence, are seldom considered.

Mr. Hodgkinson in the report before us gives the following results of a number of experiments made by him on the strength of cast-iron pillars. The experiments were made by means of a lever compressing the ends of the pillar, which stood upright between two flat surfaces of hardened steel always parallel to each other.

"1st. It was found that a long pillar, with its ends flat and perfectly immoveable, was about three times as strong as another of the same dimensions with the ends rounded, so as to be capable of turning as on a universal joint. When one end of the pillar was rounded and the other flat, according to the definitions above, the strength was an arithmetic mean between that of the other two. In other words, if three long pillars be formed, all of equal diameter and length, and one pillar has both ends made round, another one end round and one flat, and the third both ends flat, the strength of these pillars will be as 1, 2, 3, nearly.

Some of the pillars with flat ends had discs upon the ends, to give them an increased breadth of bearing; but this, however necessary in practice, added very little to the strength.

2nd. A long pillar, with both ends flat, or firmly fixed, has nearly the same strength as one of the same diameter and half the length, with both ends rounded, as above.

3rd. If a solid pillar, be enlarged in the middle to $\frac{1}{3}$, or upwards, of the diameter of the ends, and taper from the middle to the ends like frustums of two cones, whose bases are united in the middle, the strength will be increased more than the weight of the metal by about $\frac{1}{4}$ of the whole. This will be the case whether the ends are rounded or flat.

4th. Similar pillars. If long pillars be cast and turned perfectly similar, the diameter being to the length in a constant ratio, the strength was found, from a mean of several experiments, to vary as the 1·865 power of the diameter, or any other lineal dimension. It varies, therefore, nearly as the square, but somewhat lower.

5th. If a pillar with flat ends be so placed, that the pressure it sustains acts diagonally from the extremity of the diameter at one end to the opposite extremity of the diameter at the other, the strength is reduced to one-third, as was proved by several experiments. It is easy to infer, that this is a case analogous to that of a pillar with rounded ends.

6th. Relative strength of columns of different materials. Representing the strength of columns of cast-iron by 1000, I found the strength in wrought-iron 1745, cast-steel 2518, Dantzic oak 108·8, red deal 78·5.

7th. The properties of columns, enumerated above, apply to such only as have the length so great that fracture may be considered as having been produced wholly by the flexure of the column. They apply, as appears from my experiments, to all cast-iron columns with rounded ends, in which the length is more than 15 times the diameter; and to all, with flat ends, in which the length is more than 30 times the diameter, or upwards. If the pillars are shorter than this, fracture takes place partly by flexure and partly by crushing; and the properties are more complicated than as here described.

In reply to the inquiry, "Have you not given formulæ for calculating the strength of cast-iron pillars or columns?" Mr. Hodgkinson said,—I found the strength of long cast-iron columns, with rounded ends, to vary as the 3·76 power of the diameter nearly; and those with flat ends as the 3·55 power of it; the length in each case being given. When the length varied, and the diameter was the same, the strength was inversely as the 1·7 power of the length, nearly.

Taking 3·6 as an approximate term between 3·76 and 3·55, and the co-efficients, as obtained from my experiments, we have, for columns fixed at the ends.

$$W = 44{\cdot}16\frac{D^{3{\cdot}6}}{L^{1{\cdot}7}} = \text{strength of a solid cylinder.}$$

$$W = 44{\cdot}34\frac{D^{3{\cdot}6} - d^{3{\cdot}6}}{L^{1{\cdot}7}} = \text{strength of a hollow cylinder.}$$

where W is the breaking weight in tons; D, *d* the external and internal diameter in inches; and L the length in feet.

If both ends of the pillars are rounded, the strength will be $\frac{1}{4}$ of that given by the formula.

If one end be rounded, and one flat, the strength will be $\frac{2}{3}$ of that in the formula.

The preceding formulæ are applicable to columns whose length is more than 15 times the diameter, when the ends are rounded; and more than 30 times the diameter, when the ends are flat.

If the pillars are shorter than as above, they will be crushed as well as bent; and the value of W will require to be modified by the following formula:—

$$W' = \frac{W\,c}{W + \frac{3}{4}c'}$$

where *c* is the weight which would crush the pillar, in tons, if it were so short as to be broken without flexure. To find *c* multiply the area of the section of the pillar in inches by 49; since the iron I used (the Low Moor No. 3) required 49 tons to crush a prism of it whose base was 1 inch square."

Mr. Hodgkinson considers the mean crushing strength of cast iron 47 tons per square inch, and that this is on the average, six and a half times the force necessary to tear the body asunder; the tensile strength being 7·2 tons per square inch nearly.

In conclusion, we congratulate the commissioners on the quantity of valuable information which they have brought together in their report, and express a hope that the suggestions made by Mr. Cubitt may be immediately adopted.

## CHIMNEY-SHAFTS FOR BOILER FURNACES.

Schedule F of the Buildings Act, after setting forth that no chimney-shaft (except that of a steam-engine, brewery, distillery, or manufactory) must be built higher than eight feet above the slope, flat, or gutter of the roof which it adjoins, unless such chimney-shaft be built of increased thickness, and so forth, says, "And as to the chimney-shaft for the furnaces of any steam-engine, or for any brewery, distillery, or manufactory, such shaft may be erected of any height, so that it be built in such manner, and of such strength and dimensions as shall be *satisfactory to the official referees, upon special application in each case.*"

In consequence of this, the district surveyors will not permit the erection of *any* chimney-shaft for such purpose, whether of greater height than that allowed for ordinary shafts or not, without a certificate and instructions from the official referees. The mode of proceeding is to forward a drawing of the proposed shaft to the registrar, and a letter requesting permission to execute it. In reply to this a certificate is granted (on payment of the fees), containing certain instructions. These, of course, vary with circumstances: an examination, however, of a dozen or more certificates of the sort, already granted by the referees, shews the following requirements:—

The shaft must be built of sound stocks; topmost five feet in cement.

It must be bonded every six courses with hoop-iron lapped at the angles.

The base of the footings must be one-half longer than the base of the shaft, and be placed *as low as the base of the footings of any adjoining wall or building.*

If the shaft be *square*, the height of it must not exceed ten times the length of the side at the top of the footings: if *circular*, twelve times the lower diameter.

The shaft must diminish in size upwards, and be at least one-third less at the top than it is at the bottom.

The projection at head of the chimney, if any, must not exceed three-fourths of the thickness of the brickwork from which it projects.

The shaft must be lined with fire-bricks to the extent of 6 feet at the least above the opening from furnace. The fire-bricks must not be tied to nor made to support the brick-work of the structure, but be removable at will.

The shaft must not be tied to any existing building or wall, and no wood-work must be fixed in or to it.

We have given these particulars in full, not merely to enable those who may have occasion to build furnace-shafts within the limits of the Act, to prepare their plans so as to avoid being called on to make alterations, but that others may have the opinion of the referees as to the manner in which furnace-shafts whether here or elsewhere, should be constructed.

To the former, it may be useful to suggest, that when they obtain the certificate from the office they should examine how far the instructions given by the referees clash with their own particulars. The district surveyors have determined not to exercise the *slightest* discretion in the matter, but simply to see the referees, certificate rigorously carried out; so that, for example, should any precautionary measure stated in the applicant's particulars be rendered even obviously unnecessary, by some additional requirements on the part of the referees, unless the former be specially excepted, the district surveyors would insist on the execution of both.

## RETROSPECTIVE REVIEWS.

Though the desire for knowledge exists in this age in a degree previously unparalleled, it often occurs that the best aids to inquiry are entirely overlooked. The extraordinary extent, to which a taste for magazine literature has spread, has given an influence to ephemeral publications, which ought rather to have been retained by a literature of standard excellence. A month often suffices to consign a really meritorious work to complete oblivion, and a modern compilation, issued in periodical numbers, has a better chance of obtaining readers than the most original conception of an old author. Even the pursuits of the antiquary have received something of the prevailing tone, and researches in progress, and volumes on fine art, damp from the press, excite a larger amount of interest, and are more frequently consulted, than the not less important records of a year gone by. In architecture, as in other sciences, many of the most important doctrines, broached as new, were promulgated in time past; but in this art, whose especial sphere it seems, to create new combinations on a foundation of recorded fact and existing precedent, it does appear matter for regret, that many important old works, and some of late date, exist in an oblivion, from which an affirmation of their merits would be sufficient to remove them. It appears to us not less the object of an architectural journal to preserve the sources of knowledge already possessed, than to record the progress of science and art; and we shall therefore endeavour, from time to time, to call to mind the existence of certain valuable authorities, which, in the active practice of an arduous profession, and the exclusive interest absorbed by recent publications, may have escaped the notice of our readers. Our limits will not allow us to enter very deeply into the subject-matter of works often voluminous and elaborate, our object being rather to indicate where information is to be sought, than to criticise where criticism has already played its part.

### D'AGINCOURT'S HISTORY OF ART BY ITS MONUMENTS,

FROM ITS DECLINE IN THE FOURTH CENTURY TO ITS REVIVAL IN THE SIXTEENTH.*

The influence of the beautiful on the mind of man is exerted in other directions than is evident to the superficial observer, or is manifested in the conceptions of poetry and fine art. Not less the gift of nature than the sense of sight, or the faculty of reason, it is often potent, when other endowments are obscured or debased. The sensibility to melancholy emotions, and the sympathy with misfortune, which intercourse with the world does not entirely remove from the most callous, cherish and renovate the perceptions, and produce works which interest and delight the multitude. The study

* 325 plates, 6 vols. Paris, 1823. ("Histoire de l'Art par les Monumens," &c., &c.)

of history, and the examination of antiquities excite an interest, distinct from the unquestionable advantages that accrue, and the less commendable pursuit of the mere collector. Lapse of time, and evidence of decay associate with the crumbling ruin, or the misshapen fragment, an impression of beauty, which physically they might have failed to excite, and connect the scattered dust of cities with recollections of the fall of empires, and decline of states. The early state of a nation, or the period of abasement, may be not less important in their results than the most brilliant epoch in its progress, and are equally deserving of the attention of the historian.

On the 15th of October, 1764, a traveller, sojourning at Rome, whose name has now become familiar to every Englishman as the name of potentate or general, sat musing amidst the ruins of the Capitol. The sound of vespers rose from the church of the Franciscans, once the temple of Jupiter; his mind reverted from time present to time past, and the design of writing "The Decline and Fall of the Roman Empire" started to his mind. Years elapsed ere the plan was matured; but the work at length completed, the history of the period, from the most uncertain, became clear and distinct. To this period the attention of other investigators had turned, and it is worthy of notice, that whilst the work of Gibbon traces the history of Rome from the Antonines to the extinction of the empire in the east, and to the time of Sixtus V. in Italy, that of D'Agincourt, on the "History of Art," surveys a period commencing not quite two centuries later; and it seems likely, that as D'Agincourt and Gibbon both visited Paris during the same year, and were both on terms of friendship with Buffon, and other *savans* of the French capital, that the two authors were acquainted, and that the French antiquary may have gained the suggestion of his work from the Englishman, to whose history he has made reference. The period of the decline of art is taken by M. D'Agincourt to commence at the time of Constantine the Great, in the fourth century, and extends to that of Henry VII. in England, and of Julius II. in Italy, and of Albert Durer, and Leonardo da Vinci, in the sixteenth. It has of late years met with increased notice, and in Hope's "Essay on Architecture" and in the magnificent work of Mr. Gally Knight has been admirably illustrated. As the forerunner of the Gothic style it is especially interesting. The architecture of the empire, supported under Augustus by the skill of Grecian artists, declined under his successors; laborious execution and extravagant decoration were substituted for elegance of form and proportion, till beauty was crushed under a load of riches. The lives of the emperors, rendered contemptible by every degrading vice, admitted of no very healthy influence upon architecture: it became either the outlet to extravagant ambition, or the means of blinding the populace to their enslaved state. Ornament grew over every moulding, colossal dimensions, and difficulties of execution were sought, but not for the proper object of the art.

The time of the Antonines was one of temporary quiet, and other emperors left structures of vast extent in every portion of their dominions; but the *art* of architecture was gradually tending to a decline, and all powers of decoration were exhausted under Caracalla and Diocletian. Constantine destroyed the works of his predecessors to form other buildings, the principal of which were the churches of the new religion. The misfortunes which attended the fall of the empire, overwhelmed the arts in the general ruin. Many innovations were introduced, which, subsequently modified, became important features in Gothic architecture. Such were arches springing immediately from the capitals of the columns, thus used in the basilica of St. Paul, without the walls, the most considerable of the buildings of the fourth century,* and in which the old form and appellation of the basilica, or court of justice, were revived for the purposes of a Christian church. Many of the columns were taken from the mausoleum of Hadrian, and from other edifices, and are of a style of art greatly superior to the rest. At this period, columns were frequently lengthened by an additional member, and subsequently, in some cases, they were supported on the backs of animals; all these schemes originating in the want of ability or inclination to erect new works adapted to the purpose. In the church of St. Agnes we find three stories, exactly like the arrangement of the Gothic cathedral. The lower story has arches springing from the columns; above these is the gallery corresponding with the triforium, and used for the same purposes; and above this, the clerestory windows. The early period in the decline of art is rendered of great interest by the catacombs, in which the early Christians placed the bones of the martyrs, and in which they themselves often found refuge from persecution, and which the subsequent toleration they enjoyed contributed to render of the highest interest, and available for decoration. The catacomb had become more and more like the church, being used for the purposes of worship; and the motives of religion, which drew the early Christians to erect their churches over the graves of the martyrs, produced the arrangement of the upper and lower church or crypt, which became so usual at a later date. But the church itself was sometimes in imitation of a sepulchral chamber, as in a church at Ravenna. The church of St. Clement, at Rome, is believed to have been erected towards the close the fifth century, or beginning of the sixth, and exhibits the disposition of the primitive churches: the plan being similar to that of basilicas. The building is terminated by an apsis, where is placed the episcopal chair. The close of the fifth century saw the Goths, under Theodoric, masters of Italy, — some change took place in the style of architecture; but Ravenna, their principal seat, contains no remains which we can call Gothic, if the pointed arch is to be considered the leading feature in that style. The mausoleum of Theodoric is a fine work of construction, but otherwise has a low rank as a work of art. The form of the voussoirs to the arches is curious, and there are similar instances in England. The Ponte Salario, three miles from Rome, was constructed by Narses, in the thirty-ninth year of Justinian's reign, A.D. 565. The principle of solidity, which has preserved this work to the present time, seems never to have been lost by the Roman architects; but its ornaments are of such a character as would disgrace any school of art. The causes of this corruption had been multiplied: the difficulty of finding artists, who had studied the principles of the fine arts had increased from day to day, till a complete ignorance was the result, and the effect was visible upon all styles of architecture. Another course was the necessity of remodelling old forms to make them conformable to ecclesiastical rites. One of the consequences of the insufficiency of the architects was the transformation of pagan temples into Christian churches: thus the ancient temple built of brick, situated near the circus of Caracalla, underwent this change. The seat of the Greek Government at Ravenna brought the influence of the Greek taste into Italy, and the church of St. Sophia became a model frequently adopted. The church of St. Vitale, at Ravenna, was erected under the exarchate of Narses, and is remarkable for the construction of its vault, which is formed of pots arranged spirally, each one bearing on the one below it. The tribes which Narses had collected to assist him in the conquest of Italy succeeded about the middle of the sixth century in establishing themselves there. They introduced a style often bearing close resemblance to our own Norman architecture, and called the Lombard style.

"We have examined," says M. D'Agincourt, "three stages of decline: the stage first removed from the time of perfection, was characterized by a prodigality of ornament, imprinted with the Asiatic luxuriousness, which produced embarrassment and confusion. The second stage was marked by a forgetfulness and absence of the same ornaments. The third stage, of which we are speaking, is marked by the immoderate use of a multitude of accessory parts, which, far from meriting the name of ornaments, are as reprehensible for the place they occupy, as for their superabundant quality and execution. This last disorder was the general system of architecture, till the establishment in the eleventh century of that other system, to which has been given the name Gothic." The career of Charlemagne in the eighth century was marked by a fostering care for the arts, and architecture for a moment appeared to alter its whole character; but the change was but temporary. The infusion of Greek taste at Pisa and Venice also passed away: in the latter city the cathedral of St. Mark was erected by foreign artists in imitation of that of St. Sophia. According to M. D'Agincourt, the first indication of the style which afterwards swelled into the Gothic architecture of the thirteenth and fourteenth centuries occurred during the ninth century in the church at Subiaco, near Rome. But Mr. Knight, with more reason, shews there is cause to doubt whether this church is of so early a date. During the first half of this century architecture made some progress, but long before the tenth century, and during the whole of that period, its progress was completely arrested.

In the eleventh century the art was in a state of activity, for which it was indebted to Greek artists, who were employed in every part of Italy. Many of the churches in Lombardy are of this date, and they were characterized by large porches, and alternate courses of different colours. In the twelfth century, the cloisters of St. Paul, without the walls of Rome were built, in which were introduced twisted columns of every variety. To this date is also assigned by D'Agincourt, the complete adoption of the Gothic style. In the thirteenth century, Gothic architecture was the prevailing style. Mr. Knight considers there is no doubt, that the pointed arch first entered Italy in this century from the north; a singular fact, as it had previously been employed for two centuries by the Normans in Sicily. The first church which had any influence upon the style of art in Italy was that at Assisi, which is Gothic in all its parts. The fourteenth century was the period of the principal buildings of Europe, but the Italian architects never caught the true spirit of the style, or overcame the tendency to the horizontal, so inconsistent with the character of pointed architecture. It was an imitation imported by the people rather than by the artists, and there is perhaps but one building, in which it can be said to have found place in Rome. Its most striking feature is marked by the prevalence of the sister art of sculpture, in which the Italians had made greater progress. The style remained in Italy till the close of the fourteenth century, and Brunelleschi introduced a different manner in the fifteenth. The earliest works of the revival may be said to bear some resemblance to those of the decline, but greatly surpassed them. The art at once gained a new vigour; and as the Gothic of Italy had not the merits of the style in other countries, we cannot regret the change. Alberti, an architect of refined and educated taste, by his example and precepts, hastened the progress, and under Bramante, in the sixteenth century, a school of Italian architects commenced, which has existed till the present time.

The work of M. D'Agincourt is a monument of human industry. It is not confined to the art of architecture, but devotes a space, even greater, to sculpture and painting. The progress of the arts is traced, in every change of taste, from the time of Constantine to that of Michael Angelo. There are three volumes of plates, and an equal number of letter-press. The monuments of art illustrated are 1,400 in number. Several plates exhibit the gradual progress of the art, and its decline: one gives a chronological series of arches, and others shew the state of architecture in the east. The Gothic architecture of Sweden, and the Arabian architecture from the eighth to the fifteenth century are illustrated. One plate is entitled "Conjectures on the origin of the pointed arch," and illustrates some curious theories. The comparative forms of detached baptisteries, of the fronts of buildings, of vaults, cupolas, and columns, and the various modes of construction, are very clearly shewn, as well as the styles of Brunelleschi, Alberti, Bramante and Michael Angelo. The life of M. D'Agincourt was spent in the preparation of his great work, of which he did not live to see the publication.

Born at Beauvais, April 5th, 1730, he commenced his career, under the especial protection of Louis XV., in the military profession, but left it at the instance of that king, who determined to place the brothers and nephews of

* It was erected by Theodosius, A.D. 386.

M. D'Agincourt under his care. Devoting himself to the welfare of his family, the amiability of his character, and his taste for the arts, made him sought and cherished in the most distinguished circles of the capital. Having completed the duties he had undertaken, he was free to follow the bent of his inclinations. Desirous of remaining in France, he preferred a responsible post under government at home to employment in a foreign country. His reputation and talents soon drew around him some of the most celebrated men of the French capital and he employed a part of his income in the formation of a cabinet of designs, pictures, and antiquities. The study of natural history was not less an object of his attention, and he numbered amongst his friends, Bernard de Jussieu, J. J. Rousseau, Buffon, and d'Aubenton. His wit, and power of amusing, made him welcome at all the *soirées* of Paris; and his more solid attainments recommended him to men such as Marmontel, Saurin, Destouches, the younger, La Harpe, Suard, Morellet, and Voltaire. In fact, the life of M. D'Agincourt is the history of an intercourse during half a century with the most distinguished men of Europe. Passionately fond of the arts, he cultivated them as a man of taste; he designed and engraved with facility, and was on terms of intimacy with the best artists of his day. The friendships he formed only augmented his ardour in matters relating to the arts, and his desire to learn their history. At length, Louis XV. being dead, he no longer felt any obligation to refrain from the project of travelling through Europe, and especially of exploring Italy. In 1777, he visited England, Belgium, Holland, and part of Germany; afterwards returning to Paris, he remained there till the latter part of the next year, when he started for Italy. He was then forty-eight years of age. Having traversed Savoy and Piedmont, he went to Genoa, and thence to Modena, where he secured the friendship of the illustrious Abbé Tiraboschi, author of the "History of Italian Literature." He then made a stay of some months in Bologna, to examine and delineate the curious monuments in that town, having already conceived the vast project, which became the object of all his researches, and the principal occupation of his life.

In passing through Belgium, Holland, and Germany, M. D'Agincourt had directed his attention to the numerous monuments of Gothic architecture, with which these countries abound. He had studied the march, and traces of art during the "dark ages," and in the midst of productions of an extravagant taste (*d'un gout bizarre*), but often original and bold. In Lombardy and the Venetian country, monuments, more ancient still, appeared to him imprinted with traces of the fall of art from the time of the Greeks and Romans, whilst in those which belonged to the age bordering upon the *renaissance* he believed he saw the "barbarism" of the middle ages dissipating little by little, and the genius of the arts, like a new Titan crushed under an immense weight, seeking to remove the burden which overwhelmed it, darting through the interval brilliant scintillations, and soon taking a new life, shaking off the dust and rust which overwhelmed it, disengaged from its chains, full of vigour and youth, again astonishing and charming Italy, and returning to the polished world noble pleasures, the most perfect enjoyments, sweetness of manners, and enduring glory. Such were the observations, which gave to M. D'Agincourt the grand, but difficult idea of tracing the history of the arts through the aberrations, into which they had been carried by the removal of the seat of empire to Constantinople—the mixture of Asiatic taste, and the fusion of styles brought, from the north by the Goths, and the south by the Arabs. The thread abandoned by Winckelmann, at the fall of art, had never been entirely broken, and the materials for regaining it might be found amongst monuments, the least important, the most shapeless and fragile, as miniatures in manuscripts, registers and archives, in certain structures, in the bases of more modern edifices, and even in the bowels of the earth, in catacombs and labyrinths, whose origin, use, and singular ornaments, have occasioned so many conjectures, and will again occasion so many researches and discoveries. Such was, from this moment, the principal object of the labours, the journeys, and the studies of M. D'Agincourt. Towards the middle of the year 1779, he visited Venice, and remained with the Abbé Morelli, librarian of St. Mare's library. He afterwards returned to Bologna, but shortly left for Florence, and passed some months in visiting, on foot, different works of the ancients, with a view to discover the systems adopted. In November, he arrived at Rome, where he took up his abode in the house formerly inhabited by Salvator Rosa. Eighteen months hardly sufficed for him to gain a general idea of the ancient, and modern works of art. In 1781, he visited Naples, Herculaneum and Pompeii, Pæstum and Salerno, and at the end of the year returned to Rome. The labours he had undertaken were conducted with the greatest assiduity, and to bring his enterprise to perfection, he spared no labour, no expense; he directed most extensive researches in Italy and the rest of Europe, and had illustrations engraved under his own eyes of an immense number of works of art. In 1782, notwithstanding the representations which were made to him, he determined to make a detailed examination of ancient catacombs. Besides those previously examined, he had several, which had never been examined, opened at his own expense, and his researches were not unattended with danger. The labours of M. D'Agincourt, his liberality in placing their results at the disposal of others, spread his fame throughout Europe, and the world expected with impatience the work, on which he had been so zealously engaged. Louis XVI. had interested himself in it, and the plates had been sent to Paris, when the disorders of the revolution induced the friends of M. D'Agincourt to send them back again. Subsequently, the political horizon having cleared up, he confided the publication of the work to M. Dufourny, a member of the Institute, who had made researches in conjunction with his own. But the appearance of such a work was attended with extraordinary expense, and the calamities of the revolution had hardly left the author sufficient for the wants of his old age. M. M. Treuttel and Würtz hesitated not to acquire the right of publishing so important a work, and remunerated the author in such a manner, as to secure his future comfort. The wars which preceded the restoration of the Bourbons, and the difficulty of communications, retarded the publication, and the *livraisons* appeared at such extended intervals, that M. D'Agincourt could not hope to see their completion. He employed himself at this time in the publication of a work, styled "Recueil de Fragments de Sculpture Antique en Terre Cuite," containing upwards of 300 subjects. This had hardly appeared, when his last illness commenced, and finally he expired on the 24th September, 1814, at the age of 84. His corpse was followed by the French Ambassador, and by artists and literati of all nations, to the church of Saint Louis des François, where some time afterwards a monument was erected to his memory. His work filled a *lacuna* in the history of art, and has been the foundation of some, more recently published, and better appreciated. E. H.

## BUILDING GROUND, WHITE KNIGHTS, READING.

Our readers are aware that the late Duke of Marlborough's magnificent estate, known as White Knights, was purchased last year by parties who propose to divide it for building purposes, and that plans for laying out the property were obtained by the offer of premiums. The land is now coming into the market, and when we consider its surpassing beauty and its contiguity to the Great Western Railway, by which it is reached from London in less than an hour and a half, there can be little doubt that it will be speedily covered with villas. We had occasion to visit the spot last week, and are induced to think there is nothing like it in England available to the public. The botanic gardens with their magnolias and conservatory; the wilderness, filled with American plants now in full bloom; the lake, bridges, China cottage, valley and fountain, offer a succession of pictures of extraordinary beauty; and these are to be reserved for the enjoyment of those who occupy houses on the estate. Mr. Mocatta and Mr. George Godwin are appointed architects.

## THE SCHOOL OF DESIGN.

Sir,—From your observations at the bottom of the report of the progress and state of the school of design at Somerset House, it would appear that you suspect "something rotten in the state of Denmark," stating, as you do, that some further information must be elicited to prove the efficiency of the present system.

I can give you a little information, but I am sorry to say that it is to prove its inefficiency. The report sets forth that each student is taught as far as possible with reference to the promotion of the particular object for which he joined the school: further, that the more advanced students are exercised in original designs, and composition, &c., and are taught to apply to various practical purposes the skill they acquire. Sir, excuse me if I pause,—I am overpowered when I think of the talent required to carry all this into execution. Here would be a task for Cellini if yet alive! for the Italian arabesque painters—and Raphael himself—a glorious task for the old French designers Messonier, De la Fosse, and others of that school, or for Percier and Lafontaine, or for such of our English architects as have made decorative design their study; but it would at least be a task for a practical designer of twenty or thirty years' practice in the art of design for manufactures and for decorations; so at least most people would think, but not so the council of the school of design. A master who had studied the ornamental art would require a salary of two or three hundred pounds; but a portrait painter—a Spitalfields' weaver—a mechanic will do the work for 120*l.*; so they have sent down a portrait painter to Birmingham—a mechanic to some other part of the country—and installed, with great parade, a weaver at the Spitalfields' school of design for 100*l.* per year, to instruct the people in all those wonderful things which the report would have us believe are taught in the school. It is impossible to say what may follow: men will soon gather grapes on moors, and figs on thistles. What folly in any man to give a guinea to Copley Fielding at every lesson, when any person could teach as well by shewing merely a few good drawings, and at one-tenth the expense; or why give 400*l.* with a boy to a noted architect, when any bricklayer would instruct him as well for a trifle?—or why give much with a boy to a respectable, clever tradesman? The fact is, that the council maintain that, with the various examples in the school, any man may play the master, and save the money of an experienced teacher. Time will shew, but I am very much afraid that the cry in the *Times* newspaper, of "what is the school of design about?" will be re-echoed before long from one corner of the country to the other.

The director, Mr. Wilson, is a man highly qualified for the post he fills—his talents, his urbane and courteous manners, render him most valuable,—but he is fettered by a council perfectly ignorant of the qualities which ought to accompany a teacher in a school of design, and of the methods which ought to be adopted to make practical draughtsmen; for I find fault too with the immense time lost in making chalk drawings, which are perfectly useless to practical draughtsmen. I find fault too with the vague and indefinite manner in which the drawings for competition are specified, there being no common-ground given to run the race upon—the same failing which is so much to be deprecated in architectural competitions.

Having found as much fault as I can, I must now say something in praise, and for that purpose, turn with pleasure to those students who study the frescoes, and whose copies are beautiful, and very much surpass Sang's style of painting for finish; and with designs furnished by competent architects or designers, they might soon drive him out of the field—but neither they, nor Mr. Sang, nor any man living, will ever be able to paint by the yard, and design and draw too.

I am, Sir, &c.

A Constant Reader.

## GREENHOUSES, VINERIES, AND AVIARIES.

### AWARD UNDER THE BUILDINGS ACT.

Sir,—In my last to you on the subject of a pigeon-house, situate in the back-yard behind my dwelling, Princes-road, Bermondsey (see Builder of 31st of May last),* I promised to forward you the result. I beg leave now to state that I have had notice to take up the award; and protesting against the jurisdiction of the referees over such, I did not take it up at the time appointed. On the following morning, early, the district surveyor called with the award, and desired to know how I intended to act; my answer was, as before, "You have no jurisdiction, and may take what course you please."

The following is an abstract of the award:—

"We do hereby certify and award that the said building is contrary to the said Act, and we do further certify, that although greenhouses, aviaries, and such like buildings are exempted from the rules and provisions of the said Act, as to the *walls* and other requisites of attached buildings and offices, and *although no express provision* is made as to the walls of such structures, yet such structures, and the walls thereof, must be so placed and so constructed, as not to be dangerous to the adjoining premises, nor to communicate fire to the interior of the buildings to which they belong. And with regard to the costs and expenses attending this proceeding, we do further award that the same be paid by the said W. S. Hollands, the sum of 3*l.* 5*s.* 8*d.*"

For the benefit of the public, I beg to give you a description of this bird-cage or enclosure. The part alluded to is an enclosure round a few pigeon holes, or what are termed dove-boxes, which rest against a 9-inch wall—no fastening whatever; this enclosure is 7 feet by 6 feet, and 4 feet high, uprights 1¼ inch thick, and lattice sides, diamond work; it took about one and a half bundles of laths. The top is covered with zinc, it has no connection with the dwelling, and there is a 9-inch brick (sound best stocks) well built wall between. Leaving your readers to judge for themselves if or not I take the proper course,

I am, Sir, &c.

Bermondsey Square. W. S. H.

*** The award on the subject of greenhouses, which we published last week has excited much commotion. The question now is, how greenhouses and conservatories *are* to be constructed: whether or not the district-surveyor is to be called on to decide in each case, according to his own views, what may or may not be erected. The award in Mr. Hollands' case, which bears on the same point, defines the referees' views a little more closely than the first-mentioned did, and perhaps before long they will consider it necessary to issue some express instructions on the subject.

## TO LESSEN THE COMBUSTIBILITY OF HOUSES.

Sir,—Though conscious that you are much pestered with projectors and projects, I must increase the number of your tormentors by one. I have a project for diminishing the combustibility of houses. A simple one, as you will see, when I tell you that it is merely the substitution *of iron for wooden lathing* in all cases where wooden laths are now used for partitions, ceilings, studding, &c., &c. In every house that is burnt the *lathing* supplies the *train*. The fire creeps up the walls, ignites the joists and floors, and in short prepares the bonfire with perfect pyrotechnic art. No fire could possibly pass from a room without combustible laths on wall or ceiling (or wainscotting, which is rare in modern houses) to any other room. I know nothing of the comparative expense of wooden and iron laths, but I see that hoop-iron is very cheap, and laths being much thinner might be made much cheaper: the difference in cost therefore could not be very considerable, and I know that I would joyfully pay 10*l.* additional in rent for the house for which I now pay 120*l.* rent, if I knew that all its lathwork was of *iron*, and that there was a moral impossibility that I and my family should ever be burned in our beds. This additional 10*l.* per annum may represent builder's profit for 150*l.*, but I think I am safe in assuming that the difference between iron and wooden lathing would not amount to one-third of the money. All the projects of fire-proof houses that I have seen propose to substitute metal for walls, joists, and rafters, and some suggest floors; but this is all folly; walls, joists, and rafters, never begin the fire, or conduct it in its early stages of progress, and floors very seldom: it is *the light work* that begins the mischief, and carries it on.

I am, Sir, &c.,

Gordon-square, June 16. A Citizen.

*** We withhold our remarks on the above, as we shall probably be led to some general observations on the construction of fire-proof dwellings before long. If our correspondent will refer to our leading article of June 7th (p. 265, *ante*), he will see that his suggestion is not entirely novel. It is satisfactory to observe that much interest has been excited by what has already appeared on the subject in our pages.

We have received a prospectus of a "Fire Protective and General Buildings Improvement Company," formed for the purpose of introducing improved modes of constructing buildings, secured by letters patent, on principles combining the preservation of life from fire, property from robbery, and improved ventilation, for the promotion of future inventions and improvements connected with building, and the establishment of rooms for the exhibition of models and for other purposes connected with the building trade: but are at present uninformed as to the plans proposed.

## PUBLIC PARKS AND WALKS AT MANCHESTER.

We stated a few weeks since (page 203, *ante*) that a deputation from the committee appointed to carry into effect the object of providing public parks and places of recreation in Manchester, had waited upon the premier, with the view of obtaining a grant from Government in aid of their design. Sir Robert Peel then offered the sum of 3,000*l.*, which the deputation felt bound to decline, as partaking rather of the character of an eleemosynary dole than being a liberal and appropriate grant consistent with the importance of the object in view, and the relative position of the parties to it. A reconsideration of the matter has induced the committee, through the medium of the Mayor of Manchester, to address a letter to Sir Robert Peel, in which they state that they think it their duty to accept of the sum of 3,000*l.*, but indulge the hope that it will be considered by her Majesty's ministers and by Parliament as a portion only of that assistance which a community like Manchester may reasonably seek at the hands of the Government; and, after referring to the great personal interest which the premier has manifested in the success of the experiment, they state that the sum paid into the bank to the credit of the committee amounts to 27,409*l.* 2*s.* 11*d.*

The following is a copy of Sir Robert Peel's answer:—

Whitehall, May 29, 1845.

Sir Robert Peel presents his compliments to the Mayor of Manchester, and begs leave to acknowledge the receipt of his communication of the 26th instant.

Sir Robert Peel will give directions for the issue of the sum of 3,000*l.* in aid of the voluntary contributions raised in Manchester and its neighbourhood for the purpose of providing public parks and places of recreation, but he does not feel himself justified in giving any assurances on the subject of a further additional grant.

Sir Robert Peel is much obliged to the Mayor of Manchester for the information conveyed in his letter respecting the progress made by the committee, and offers his best wishes for the successful progress of their useful labours.

Gem Engraving.—The committee of the Art-Union of London in their last report drew the attention of the public to the neglect into which gem-engraving had fallen in this country. To follow up the subject they have now offered three premiums of 60*l.*, 30*l.*, and 15*l.* for the best cameos in profile of the head of Minerva, having a sphinx on the helmet, in the collection of bronzes at the British Museum. They must be cut in onyx of not less than two strata, and be at least one inch in length.

## THE NEW ROAD THROUGH WESTMINSTER.

Sir,—I have read the remarks in The Builder respecting the improvements from Pimlico to Westminster Abbey with almost painful interest. It is certainly most lamentable that a gentleman holding so responsible an office as the Earl of Lincoln does, in a commission of taste, improvement, and embellishment, should have pledged himself so hastily to carry out any one plan without consulting the wishes of the community at large.

I see by the voluminous Second Report of Metropolis Improvements of 2nd August, 1838, that Mr. Rigby Wason joined a number of gentlemen in the purchase of all the property from Brewer-street to the Broadway, in the line of the intended new street, with the patriotic view of aiding in these improvements; and it would perhaps be unjust to alter the plan so far as their purchases extend, *i. e.* from Broadway to Brewer-street. But surely there can be no impropriety in modifying the plan of the new street from Broadway to the Victoria Tower.

As the Bill is now before Parliament, no time should be lost in endeavouring to procure an alteration in the Bill or the plan of the street, or the insertion of a clause to reserve the power to Government of improving the vicinity of Westminster Abbey at some future time. The dean and chapter do not like to be disturbed; but when they are gone, any new appointments might be made with an understanding that their residences would be removed across the road, and subterraneous passages formed to the Abbey cloisters for their convenience.

I think that arcades across a road on the south side of the Abbey, as recommended by the Metropolitan Improvement Society, would in some measure obstruct the view of the two principal buildings, viz., the Abbey and the Victoria Tower. A subterraneous passage, on the contrary, would leave the road open, be much more private, and being made on the same level as the cellar floors of the present old houses, and of course also of the new, the alteration of the residences would scarcely be felt by their inhabitants. And if the roadway were raised at that spot only two feet (a rise that would be quite imperceptible to passengers) it would admit of a good height for the passage ceilings, at the same time that the floors would not interfere with making the main sewer of a proper height and depth.

I really wonder at the commissioners, that they should so far forget themselves and their office, as to wish to build out of view the venerable towers of Westminster Abbey and the splendid new Victoria Tower; but it is just like our forefathers (and we must blame them no more) who built out of view the noble cathedral of St. Pauls, when they erected their narrow, crooked, Ludgate Hill.

Although I am a stranger in London, I feel so great an interest in having the improvements *well done* if done at all, that I have written a petition to the House of Commons and signed it, and I take the liberty of sending it to your office for public signature.

I do hope and trust you will exert your influence and stir up the friends of improvement to use dispatch in this matter, for no time should be lost. I remain, Sir, &c.

T. I. M.

*** The petition lies at the office for signatures.

## CEMENT ON IRON.

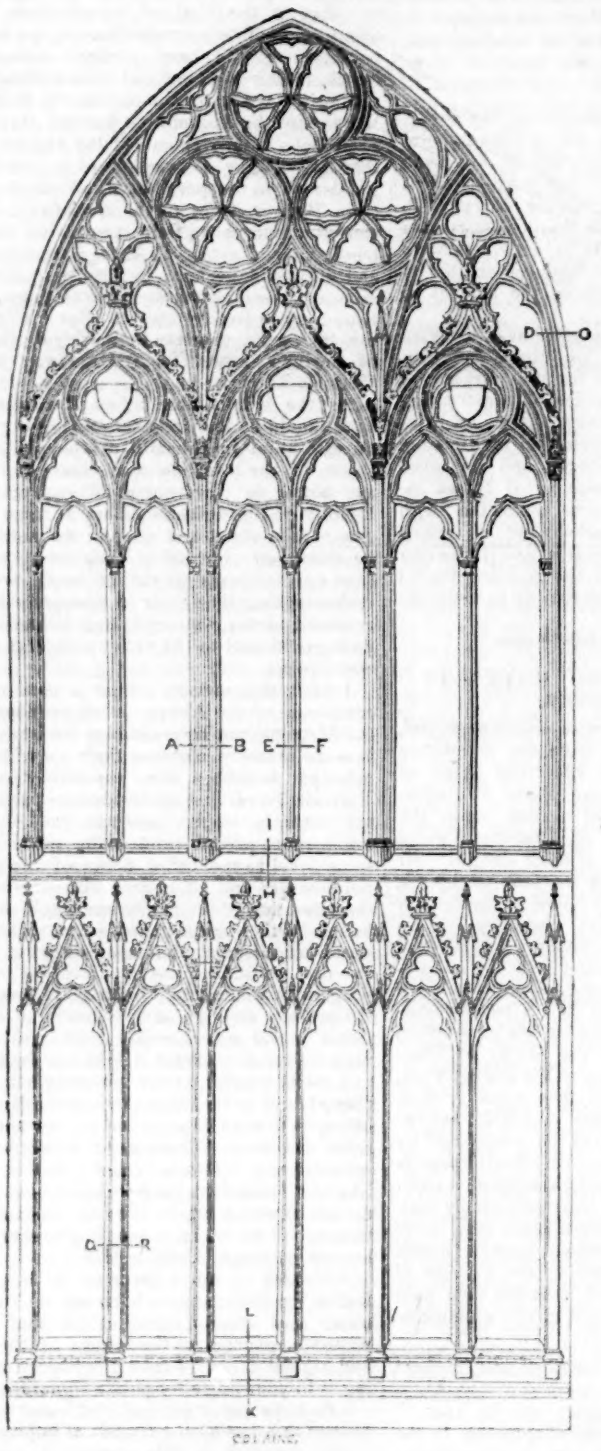
In reply to your correspondent at Worcester, *all cements mixed with water* are objectionable as applied to iron; the most effectual mode is to run the mouldings with Hamelin's Patent Mastic, manufactured by Messrs. Charles Francis and Sons, Nine Elms, London. This mastic is mixed with linseed-oil to the consistency of damp sand, and, previous to the application, the iron girders should be well saturated with *boiled* linseed-oil. Hamelin's Mastic has been in use for upwards of thirty years, and sticks most tenaciously to all kinds of hard substances: I have even used it upon glass. It requires an expert workman to manage it, what the London men call a regular "mastic hand." However, the manufacturers will, if requested, send ample directions for the use of the material.

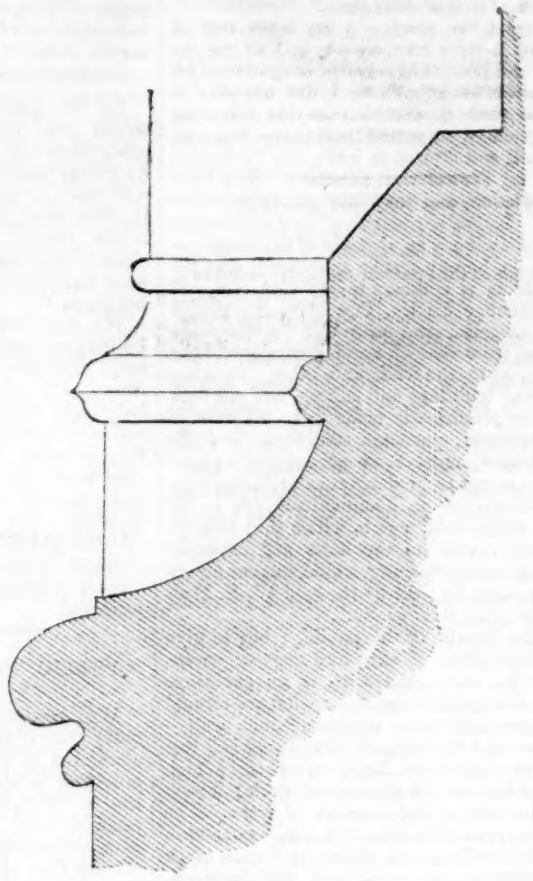
Frank Tyrrell.

Newcastle-upon-Tyne, June 12th, 1845.

* Page 256 *ante*.

## NEW DOORWAY AND DETAILS FROM YORK MINSTER.



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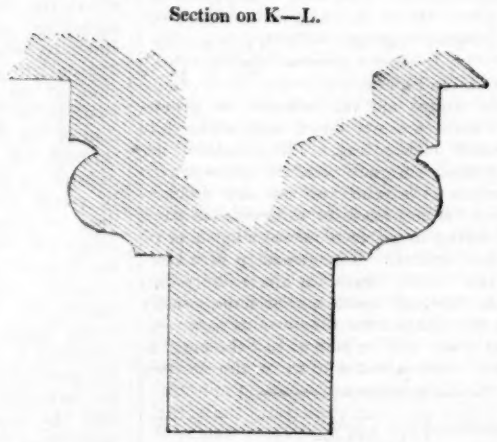

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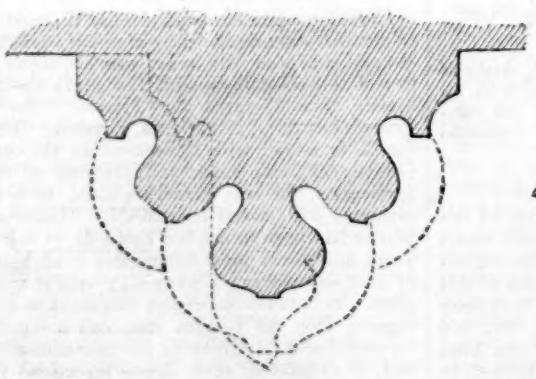

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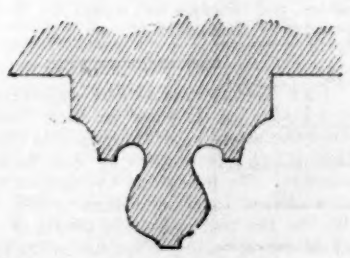

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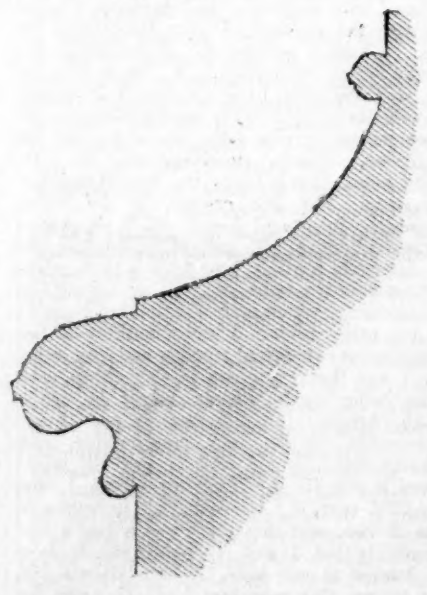


Section on H—I.

## NEW DOORS AT YORK MINSTER.

When York Minster was last attacked by fire, the centre and south doors of the west front were destroyed. The annexed engraving represents the new door designed to replace the latter, by Mr. Sydney Smirke, together with some of the details at large.

Next week we shall give an engraving of the centre door, with the scale and all the remaining details. They are from drawings by Mr. James Wylson, who wrote the account of the recent fires and restorations at the Minster, which appeared in former Nos. of this journal.*

## GEOMETRY OF BRICKWORK.

### BRICK CAMBER ARCHES.

The heads of the apertures of doors, windows, and other openings are most frequently finished with straight arches being placed across them. When, therefore, straight arches are required to be executed in gauged brickwork, it becomes necessary, in order to adapt bricks to such a purpose, to prepare moulds or templets for marking, cutting, and tapering the bricks so that when the bricks have been cut and rubbed and brought to correspond with the moulds, and are arranged and set in their places, they shall then form strong, neat, uniform, and symmetrical arches. Straight arches of this description are usually termed *cambered* arches, the soffit lines of which are made concave, or to rise upwards from the springing points with a curve. A perfectly straight line, from some optical illusion, always seems to bend or sag downwards, and it is principally for this reason that what are called straight arches are cambered so as to prevent them from having a sagging appearance; and, moreover, if the soffits were not executed with a camber, it is very likely that they then would become round from the shrinkage and settlement of the work.

The degree of camber, or rise, from the straight line which connects the springing points of the arches varies with the widths of the apertures. It is the usual practice to make the camber rise one inch to an opening of 8 feet; but it would involve considerable trouble to strike a curve for every arch when they are of unequal widths, therefore, in order to prevent the necessity for this, bricklayers are provided with a camber-slip, which is made of a piece of good deal or mahogany, about 4 inches wide, and half an inch thick; and this, from being made of sufficient length, say 6 to 8 feet, is capable of answering to any opening up to this width. One edge is made to the curve of a segment of a circle, according to the above proportions, and the other edge is made either straight or with a curve, which rises about half an inch or half the height of the other. The intrados of the arches is described from the greater curve, and the extrados from the lesser; and sometimes the extrados is made straight; but the proper way is to make it of the lesser curve. Now in order to obviate the necessity of striking the curve of a camber-slip with a radius, that otherwise must be of great length, another method is usually adopted for that purpose, which is very simple, and is well known to almost every carpenter. The principle is deduced from the twenty-first proposition of the third book of Euclid's "Elements of Geometry" (*which see*) namely, that all angles in the same segment of a circle are equal to one another. The following description will shew the manner of drawing the curve in question; and by the same principle and varying the proportions, any portion of the circumference of any circle however flat, may be drawn by it; and it is at times of manifest utility to all persons engaged in building.

Let *a c* (fig. 1) be any chord of an arc or width of an aperture, and *d b* any versed sine or rise of the intended arch. Place two pins or small nails at the extremities of the given chord *a c*, and place two long rulers or straight-edges against the nails, the rulers crossing each other and intersecting in the point *b*, forming an angle, *a b c*. They must then be fastened together at the lap *b*, and also by a brace across on the straight-edges, so as to retain this angle. Bring the point *b* of the intersection of the straight edges to the point *a*,

* See pp. 158 & 175.

## DIAGRAMS TO ILLUSTRATE THE ARTICLE ON GEOMETRY OF BRICKWORK.

*Fig. 1*

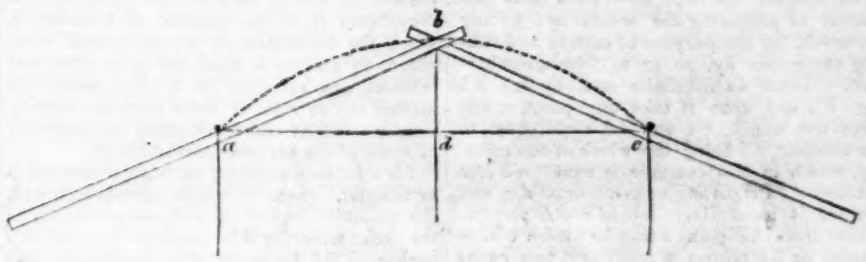



*Fig. 2.*

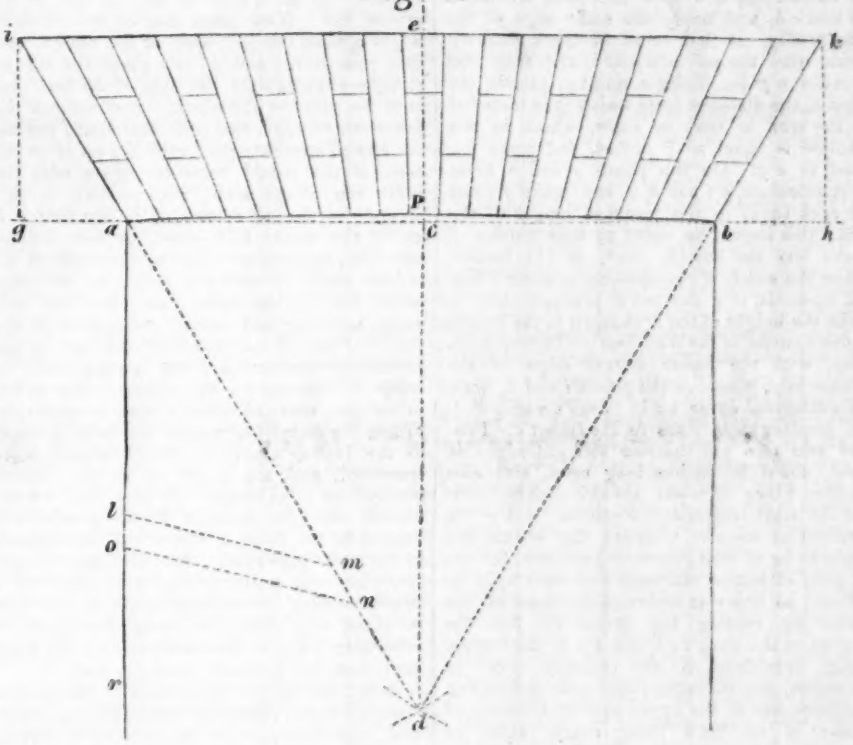
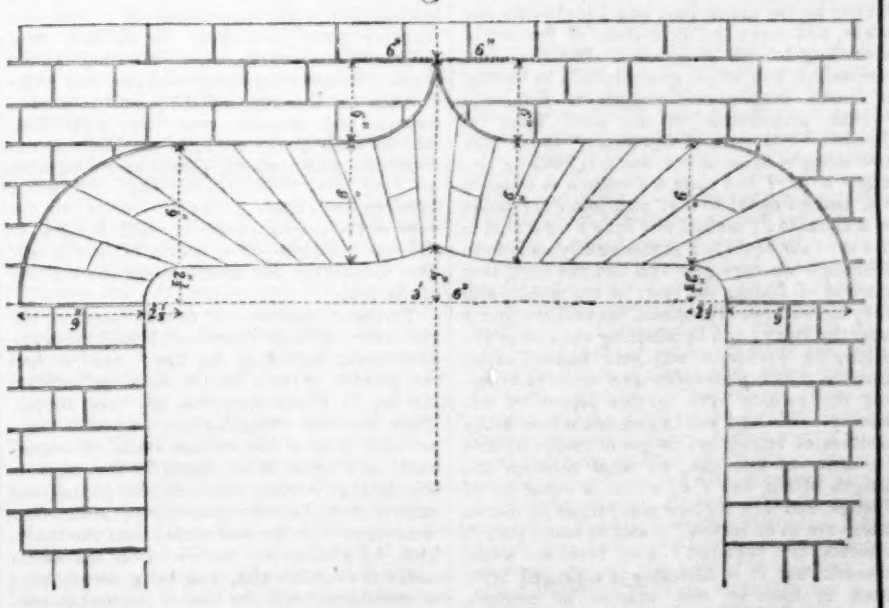



*Fig. 3.*



and then hold a pencil in the intersection, and slide the edges of this instrument against the nails, and the pencil will describe the arc *a b c* as required. Each of these straight-edges must be somewhat longer than the chord *a c*, otherwise the whole of the curve cannot be drawn at one operation.

The bricklayer, then, being provided with a camber-slip, which ought to have a line marked or finely cut-in across it at the centre of its length, we will now shew him the manner of preparing the moulds and getting the bevils, for the purpose of cutting and rubbing the bricks by, so as to form a camber-arch. Draw an indefinite straight line, *g h* (fig. 2), and upon it take any point, *c*, and make the length, *c a* and *c b*, each equal to one another, *a b* being the width of the opening, which in this example is equal to 3 feet 2 inches. At right angles to *a c* draw *d c*, and produce it indefinitely beyond *c*. A perpendicular from the point *c* may be drawn with a square, or by taking *a* and *b* any two equal distances from *c*, as centres, and with any radius greater than half *a c*, describing arcs intersecting each other in the point *d*, then drawing a line through the points *d* and *c*, and it will be the perpendicular required. Now set off on each side of the centre line of the camber-slip two equal distances, similar to *c d* and *c b*, and apply the soffit edge of the camber-slip, so that these distances shall coincide with the points *a* and *b*, and draw the intrados *a p b*. Take a point *g*, outside the point *a*, the distance from which it is intended for the arch to rake or skew, which in this example is equal to 7 inches, and make *b h* equal to *a g*. On the points *g* and *h* erect perpendiculars, *g i* and *h k*, and make *g i* and *h k* each equal to the intended height of the arch; this should be equal to four courses of bricks less the bottom joint, or 11¼ inches. When the width of the opening is about 5 feet and upwards, it is the usual practice then to make the height of the arch equal to the height of five courses of the wall, less the bottom joint. Then with the lesser curved edge of the camber-slip, placed on the points *i* and *k*, draw the extradosal curve, *i e k*. Join *i a* and *k b*, and produce these lines to the point *d*. Procure two thin and narrow straight-edges of wood, about 20 inches long each, and also another piece of wood about 3 inches wide, and the same length as the others; this is for a mould or templet to mark the bricks, and ought to be of well-seasoned hard oak, for the purpose of better resisting the wear upon it.

Now, in order to ascertain the taper of the mould for cutting the bricks by, find the lengths of the lines *i e k* and *a p b*, the former being, according to this example, equal to 52 inches, and the latter equal to 38 inches, and the thickness of the upper part of a course of bricks of an arch being nearly equal to 2¾ inches, then, by the rule of three direct, as 52 : 38 :: 2·75 : 2·01, that is 2 inches nearly, the thickness of the bottom.

Now draw a line square across the intended mould near to one end, and at 11¼ inches (the height of the arch) from it, draw another similar line; then from the edge of the mould set off 2¾ inches on the upper line, and 2 inches on the lower, and make the inclination of the mould according to this proportion. But the same inclination may be got geometrically by finding a fourth proportional, which is from the twelfth proposition of the sixth book of Euclid's "Elements of Geometry," thus: take two straight lines, as *a d*, and *a r*, forming any angle *d a r*, and upon *a d* make *a m* equal to *i e*, and *a l* equal to *a p*, and join *l m*; make *m n* equal to 2¾ inches, and draw *n o* parallel to *l m*; *l o* is equal to 2 inches nearly as before. Although we here give this and the foregoing method of finding the taper of the mould, still they are but approximations, but they are pretty near the truth; and by adopting the one or the other the bricklayer will save himself much trouble, which must otherwise arise in bringing the moulds even to this degree of accuracy. We now want to ascertain how many courses of bricks can be got in the arch, and in order to find this, we must measure the length of the line *i k*, which is equal to 52 inches, and then try how many times 2¾ inches there are in 52 inches; it will be found that 19 courses are required. And here we would remark that it is desirable in a gauged brick arch to have an odd number of courses, so that the odd courses may stand in the centre, and form a key to the arch; and the bottom, or soffit brick, of the key-course should always be a stretcher. We have assumed 2¾ inches as being the size of the top part of a course of bricks in an arch, but any other dimension, either more or less, may be taken instead, as bricks vary in thickness; and therefore a thickness must be taken according to the size the bricks will hold. And although we have been thus particular in shewing the manner of finding the taper of the mould, yet sometimes it is the practice of bricklayers, when the inclination of the skew-back is not given, to assume a taper for it at once, and without any attention as to how much the arches are to rake or skew from the perpendicular; this of course obviates the necessity of some of the previous performance.

Now fix on a point on the edge of the mould or templet, where its width corresponds with the bottom thickness of a course of bricks of the arch, which in this example is equal to 2 inches. Find the centre of the mould at top and bottom, and draw a line along it through these points. Then place the mould in the situation of the key course, so that the centre line on the mould may coincide over the centre line of the arch, and also that the point on the edge of the mould may come over the line forming the soffit of the arch, and on the left side of the centre line. Now place one of the straight edges against the left edge of the mould, and then remove the mould, and place the second straight-edge against the edge of the first, that is in the place of the mould; now remove the first straight-edge, and slide the mould against the second straight-edge, until the point on the edge of the mould coincides again with the soffit line of the arch; and proceed in this manner to the last course, or to the line *a i*, and if the mould falls short, or runs beyond this line, the process must be repeated, in the former case by taking a point on the edge *above*, and in the latter case *below* the first point, until the last course coincide with the line *a i*; and if the mould should not be parallel with the line *a i*, a few shavings must be taken off the edges with a plane, either at top or bottom, so as to make it taper accordingly. When the templet or mould has been brought to the proper taper, it should be once more traversed, and the joints of all the courses marked as it proceeds. It may also be observed, that the joints of all the courses will radiate to the point *d*, where the inclinations of the skew-backs meet. It is necessary to state that particular attention should be observed in firmly holding the straight-edges, so as not to let them slip, while traversing the mould, as otherwise it may be the means of creating great confusion, and probably spoil the work.

Now, having got the mould to the proper size and taper, something less than this thickness must be taken for the purpose of getting in the putty joints for bedding the courses. Place the mould in its proper position at the key course, and then place the straight-edges one on each side of it, and close to it. Then push the bottom of the mould upwards, and place, in the vacant space, between the left hand straight-edge and the mould, at top and bottom, two equal substances of a thickness which a putty joint is to be of, and push the mould downwards, closely pressing against them. Remove the straight-edges, and make a mark on the edge of the mould below the former, and directly over the soffit line. All the soffit bricks are to be marked and cut from this point, which should be cut in, what we shall now term, the top edge. It is the practice sometimes to make a mark on the edge of the mould where its width is equal to the top thickness of a course of bricks, and then to traverse the mould along the top line of the arch.

The next operation is to find the bevil for the soffit of each course of bricks from the skew-back, including the key; and to find the lengths of each course from the soffit to the top. These processes are very simple. Place the two straight-edges perpendicularly on each side of the extremities of the skew-back, and upon them firmly fix the camber-slip, so that it coincides with the points, and exactly with the soffit line of the arch; now commence with the first course next the skew-back, by placing the narrow end of the mould under the camber-slip, and bring its top edge to correspond with the line of the first course, and, with the point cut on the edge over the point at the soffit line. Hold a knife or pencil against the soffit edge of the camber-slip, and make a mark across the mould, this mark, with the bottom edge of the mould, is the angle, or bevil for the first course. Now make a mark on the top edge of the mould at the extreme upper point of this course, that is, on the extrados of the arch; and the distance from the lower mark to this is the length of the top of the first course. The bevils of all the other courses, and their lengths as well, can be taken off by the same processes. The bevil of the skew-back is taken by laying the mould above the line *g a*, with the lower edge straight with it, and the larger end projecting somewhat over the line *a i*; then, by laying a ruler across the mould, straight with and over the line *a i*, and drawing a line across the mould by the edge of the ruler, this line, with the edge *g a* of the mould, will be the bevil or angle of the skew-back. In order to form the skew-back bricks, the stock of the bevel is applied against their bottom outer edges; the blade laying across their faces being a guide to the tin saw in marking them; then, apply a square against their faces to the lower and upper points of the bevils, and mark the bottom and upper beds across; then cut away the superfluous material at the ends to these marks, and afterwards rub them on the stone until they suit the bevil. Sometimes the top bricks of the arch are not cut to their lengths till the last, when the arch is laid down on a bench, and the lesser curved edge of the camber-slip being laid upwards on the arch, the tops of all the bricks are then marked by it and cut. In the execution of camber arches it is desirable that the whole of the courses of bricks should be of uniform thickness. This is requisite, not merely for the purpose of obtaining a regular appearance, but in order to adapt the bricks to the work, and to prevent them from being cut away and wasted. According to the foregoing method of striking out a camber arch, all the courses of bricks will be of equal thickness; for if lines be drawn from the points of the soffits, and at right angles to the joints, the square ends thus cut off will all be of equal thickness.

The bricks which are to be cut for the arch are first rubbed on a stone, and made square; the bottom outer arrises being also made as straight and fine as possible. In commencing a course of the arch, the bevil of the soffit brick is first marked across the face near to one end; a square line is then made from the lower point of the brick across the bottom; a bevil line is then marked in on the back face from the point of the square line where it cuts the bottom back edge. The superfluous substance being now cut off, the end is then rubbed, and made as clean and uniform as possible, properly adjusted to the bevil, and square from the outer face. The brick is then laid on what is termed a bedding stone, which is usually a piece of thin marble about 9 inches wide and 2 feet long. It is then marked with a small tin saw, or a nail, from the mould, which is placed against the front and back sides of the brick; the fixed point cut in the edge of the mould being always brought so as to coincide with the upper point on each side of the soffit. The marks on the front and back faces at the points next the soffit are joined with a line which is cut in the end of the soffit, and is thus made parallel with the bed. The brick is then turned on edge with its face upwards, and the tapering mould is then placed against the soffit with one edge kept about ¼ inch above the brick. The edge of either the header or stretcher side of a thin, oblong templet of wood, whose angles are made perfectly square, the width of the header being 3¾ inches, and the width of the stretcher being 7¾ inches, is then placed against the mould, the other edge being the guide for the tin saw, in marking either the header or stretcher with. By this manner of proceeding, it will be seen that both the headers and stretchers are marked off parallel with the soffits. The superfluous brick at the end and top side is now cut away with the brick-axe; but the utmost care should be taken to cut the ends of all the bricks as square as possible from the outer face, as want of care and neglect in attending to this important particular is very often the cause of arches settling and bulging outwards, and the centre bricks dropping out of their places. For when the courses are being set, all deficiencies are usually packed up with mortar;

which, from not being of sufficient solidity to bear the weight of the superincumbent pressure, yields to the impressed force, and, therefore, causes the arches to crack and give way. After the superfluous material is axed off, the brick is then rubbed on the rubbing-stone, and great nicety is required to be observed in this particular, so as to bring the upper edges of the brick, both at the back and front faces as well as at the end, to the exact gauge, as then the joints will not only be of equal thickness throughout the arch, but the whole of the bricks when set will be better calculated to sustain and distribute equally among them the pressure under which they are liable to be subjected.

The soffit brick, then, being finished, the next step is to prepare the upper brick. The end which is to be placed next the soffit-brick is to be cut and rubbed square from the face, and made to suit the bevil of that course; it is then placed against the end of the soffit-brick, and marked both on the back and front face with the tapering-mould, its length being taken from the mark which corresponds to the length of that course. The bevil is then to be placed against the top edge of the brick to the mark, and its length marked across to the bevil with the tin saw, the ends being marked square across also. The angles which the end makes before the brick is tapered are equal to those of the other end, and although there will arise some little irregularity in the tops of the upper bricks of the arch, arising from the difference of curvature between the extrados and intrados, still it will be found to be so very slight, as not worth noticing in actual practice. The superfluous material of the brick in question is then to be axed off, and the brick, as cut, must then be rubbed carefully on the stone so as to correspond with the taper of the soffit-brick and the mould. The same operations are then to be gone through with the remaining courses.

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We have received the following note, which will sufficiently explain itself:—

"Sir,—Will you be so kind as to inform a bricklayer the proper method to strike out an arch, of which the enclosed is a sketch as near as I can make it, so that it can be executed in brickwork, and set in putty. The opening is 3 feet 6 inches, the rise 4 inches, the face 9 inches, and soffit 4½ inches, and you will oblige your humble servant, H. J."

We have somewhat altered the original rough sketch, as sent us, in order to make the arch more suitable for execution. All the courses of bricks of an arch of this description are to be struck out upon precisely the same principles as are those of the foregoing camber arch. The courses, as arranged in the annexed arch (fig. 3), were traced and marked from a small paste-board mould by following the soffit curve. An approximation to the proper taper for the mould was obtained by finding the lengths of the extradosal and intradosal lines; then, as the length of the extrados : the length of the intrados :: the thickness of a brick at the top : the thickness next the soffit. From what has been said in reference to the execution of a camber arch it is supposed that no difficulty will arise in striking out and executing an arch similar to this. The centres and dimensions are sufficiently definite and need no description.

The courses of bricks of both two and four centred arches are usually arranged upon the same principles as the camber arch; a taper is generally assumed for the mould, which is placed in the situation of the key-course, and traversed downwards until it coincides with the springing line. And sometimes the courses of bricks of elliptical arches are formed by the same method; but we intend by-and-by as our time will permit, to give a general description of forming and executing gothic, elliptical, semi-circular, segment, and other arches, as well as niches.

With reference to the manner of *setting* gauged work generally, we must also leave that until another occasion.

John Phillips.

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Smoke Prohibition Bill.—Last week, on Mr. Mackinnon moving that the House of Commons resolve itself into a committee to further this measure, it was observed that only 29 members were present, when an adjournment immediately took place!

## INSTITUTION OF CIVIL ENGINEERS.

At a meeting held 10th June, 1845, Sir John Rennie, President, in the chair, the paper read was by Mr. James Stirling, and described an ingenious air-engine, invented by his brother and himself. The movements of this machine are founded upon the well-known pneumatic principle, that air has its bulk or pressure increased and diminished in proportion as its temperature is raised or lowered. The application of this principle was exemplified by drawings, and a model, exhibiting a machine composed of two strong or tight air vessels connected with the opposite ends of a vertical cylinder, in which a piston works in the usual manner. Within these air vessels are suspended two air-tight vessels or plungers, filled with non-conducting substances, and attached to the opposite extremities of a beam capable of moving up and down alternately, to the extent of one-fifth of the depth of the air-vessels. By this motion of the plungers the air, which is in a heated state below, is moved to the upper part of the vessels, and in its transit traverses a series of vertical capillary passages between thin metallic plates, which absorb the greater part of the caloric; the remainder is taken up by a refrigerator of tubes filled with water; the air at the heated end is at about 700°, and has a proportionate pressure. When it arrives at the cooled end, it is reduced to about 150°, and the pressure diminished to a corresponding extent. Therefore, as the interior vessels move in opposite directions, it necessarily follows that the pressure of the condensed air in one vessel is increased while that of the other is diminished. A difference of pressure is thus produced upon the opposite ends of the piston, and a reciprocating motion results, which is communicated through a beam, connecting rod, crank, and fly-wheel to the machinery when driven. Machines upon this principle were stated to have been worked for some years past at Dundee, with considerable saving of fuel, as compared to a steam-engine of similar power, and doing the same work. It is now proposed to adopt it to marine purposes, to which, from its simplicity and slight expenditure of fuel, it appears well fitted. The theory of the expansion of air, and its practical adaptation as a moving power were very fully discussed, as were the mechanical difficulties which appeared to have been very ingeniously overcome by Mr. Stirling, who attended the meeting, and explained his invention. The engine appeared to receive the approval of the members who were evidently not prepared to find so perfect a machine, and one so practically useful.

On the 18th instant a paper was read by Mr. G. Edwards. It described the method employed for breaking up the shoals in the river Severn, between Stourport and Gloucester. These shoals consist of marl rock, so compact and tough, as to resist all attempts to break it up with the steam-dredger, or by prize-bars, or with a powerful species of subsoil plough. Recourse was therefore had to blasting with gunpowder, and the process of these operations formed the subject of the paper. It appeared that during the summer months there was in some places only 2 feet depth of water over some of the shoals; and the navigation was therefore greatly impeded.

In 1842 an Act was obtained for the improvement of the Severn; and under the directions of Mr. W. Cubitt the various works were commenced. The object was, to obtain a channel with a depth of at least 6 feet of water at all times throughout the river. Messrs. Grissell and Peto were the contractors for the work, and for them Mr. Edwards designed and executed the blasting operations. A series of rafts were moored in a line over the shoal parallel with the bank of the river. Along the centre of each raft, there was an opening through which wrought-iron tubes 3½ inches diameter, were driven down at intervals of 6 feet apart through the gravel down to the marl; withinside these tubes the workmen used the chisel-pointed jumperbars to make the short holes to a depth of 6 feet below the surface. The loose stuff was extracted by an auger-tool, a cartridge of canvas, well pitched and tallowed, containing 3 lbs of powder, was lowered through the tube into the hole, which was well rammed with loose marl. The charge was then fired by means of Beckford's fuse. There was generally but little apparent external effect from the shot, except lifting the pipe a few inches, but sometimes a column of water would be driven up through the pipe to the height of 40 or 50 feet. It was found that each shot loosened a mass of marl of conical or parabolic form, of which the borehole was the centre and its bottom the apex, so that four adjoining shots of two parallel lines would leave between them a pyramidal piece of marl, which was removed by the dredging machine with the loose stuff. This operation of blasting was repeated in parallel lines down all the shoals, and the stuff was dredged up at the rate of 200 to 300 tons per day. The cost of the blasting was about 9s. 9d. per cube yard. It was stated that the six principal shoals had all been successfully operated upon, and great credit had been given not only to the design but also to Mr. Edwards for the systematic and complete manner in which he had arranged and conducted the operations.

An excellent working-model was exhibited, by Mr. Slyde, of the steam-excavator. Several alterations appeared to have been made in its form and the mechanical parts of its combination, adapting it for dredging under water. It was much improved, and seemed now likely to become a useful instrument in engineering operations.

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## SUSPENSION BRIDGES.

Sir,—I have but this moment seen The Builder of the 31st, and should have been astonished at the attack upon my plan of bridges if I had not known the source of your information. The first part is from a letter by "An Old File," which appeared in the *Mechanics' Magazine*; this is a direct falsehood, and for proof that it is so I refer you, and such of your readers as may be interested in the subject, to the number of that excellent periodical that was published on the 31st. The second part I think is from the *Mining Journal*, which is also equally false, and is refuted by calculations in the last number of that periodical. But lest this may not be the particulars to which you allude, I will give you a list of the bridges that have been and are erecting on my plan, which vary from the small ones in the park to bridges for the heaviest traffic of 250 feet span. They are—the Victoria Bridge, Bath; five Government bridges, in the Regent's Park, London; five for the Indian Government; one across the Leven, in Scotland, for Sir James Colquohoun; two for the Earl of Caledon, in Ireland; one across the Bam, at Banbridge, in Ireland; one for G. S. Harcourt, Esq., at Wraysbury, near Windsor; one for H. Miller, Esq., at Frome; one for the river Lea trustees, at Bow, Middlesex; a county bridge in the parish of Hexton, Wilts; and a private bridge for Col. Wroughton Stowal, Wilts. Besides these I have upwards of 30 copies of plans, &c., in my office at the present time for bridges in contemplation, or about to be erected, in various parts of the world, with which I am connected. I also refer to all I have written upon the subject, and shall be happy to hear and to consider any objections that may be raised against either of the bridges that I have erected, or any that are in contemplation, or against anything I have written upon the subject; but I must beg the favour of argument being used rather than assertions.

I do not wish to criticise any other part of your remarks, for this is all that concerns me, yet still I will hazard a few observations on them. I must object to your position, that calculations are not always to be relied on, it is the abuse and not the use of them that mislead men. The accident at Yarmouth would not have happened if the engineer had calculated the forces of that bridge, for I find from the data given it was capable of resisting a weight on the platform of only 40 lbs. per square foot with safety, whilst at any time it was liable to a load of 70 lbs. There is another point in which I differ from you, though I grant percussion, &c. may alter the internal structure of iron and weaken it, yet in a bridge which is perfectly quiescent, nothing but being strained beyond the limits of elasticity can effect the strength of the structure, the determination of which is a matter of *calculation*,

and if adhered to, nothing need be apprehended. I could instance several suspension bridges that have stood many years in this country without injury, whose limits of elasticity do not exceed 30 lbs. per square foot, whilst at any time they are liable to be loaded to 70 lbs., which they may bear once or twice, but it would permanently cripple and weaken the structure, and repeated loading eventually destroy it. I must also differ from you in supposing that a suspension is more liable suddenly to give way than a compression bridge; in proof of the contrary I will instance the fall of the bridge across the Mill Fleam, at Derby, those at Ashton-under-Lyne, and several others that have occurred lately by which lives have been lost. The fact is, the erroneous principles upon which both suspension and compression bridges are constructed of necessity compel their failure directly any part, however trivial, yields. This for several years I have been trying to impress upon the public, and have at last succeeded. And though there are still many persons who object to my plan, yet I am happy to know that eventually they must acknowledge it to be correct." For upon what natural principle can it be argued that the failure of a single part, however trivial in itself, should destroy the whole.

It is impossible but that some parts must be weaker than others, and the weakest part will always be proportionably most strained, and should at any time the pressure on these parts exceed the limits of elasticity, it yields, and the bridge fails also. What argument then can be brought forward to support a principle that reduces the strength of the whole to that of the weakest part. And I tell the mathematicians (for as I know something of that science, without presumption may I tell them so) that the principle is wrong—and not all the reasoning in the world can make it right—and that a bridge should no more be destroyed by the failure of a single part than a limb of a tree should fall down by lopping off a part from it; the fractured end in both instances would fail, but the rest should remain as firm as ever.

I am, Sir, &c.,

Bath, June 16th. JAMES DREDGE.

N.B. The Montrose Bridge did not fall at the opening, but a long time afterwards at the time of a boat-race. J. D.

*** We have inserted Mr. Dredge's letter, notwithstanding that a threat of an action for libel if we did *not* do so accompanied it, and had nearly led us to adopt a contrary course.

## SIZE OF MAIN DRAINS UNDER BUILDINGS ACT.

SIR,—I am at a loss to know what size to make the main drain for carrying off soil. In the Act it mentions, that it must be in transverse section at least equal to a circular area of 9 inches diameter. Now, as I am not sufficiently competent to understand such ambiguity, will you, in your next number, make the point clear, for I find many other persons puzzled equally as much as your humble servant, A BRICKLAYER.

*** We wish no part of the Act was more ambiguous than the clause quoted. A 9-inch barrel drain (or larger) may be used, or a drain of any other shape provided it afford water-way (area) equal to a 9-inch barrel drain. The area of the latter is 5 inches and 3 parts, so that, for the sake of example, a rectangular drain not less than 9 inches by 7 inches may be used, or one 12 inches by 5¼ inches, since the area of either of these is equal to that required.

ARCHÆOLOGICAL CONGRESS AT LILLE.—Members of the French Archæological Congress held at Lille, visited Tournay on the 8th inst., and examined all the antiquities of that very interesting town. They were received with extraordinary demonstrations of respect even to the ringing of the great bells of the cathedral. Relative to this, the bishop of Tournay who received the congress in the episcopal palace said, "The bells you hear gentlemen, sound but for God and our princes: you are the princes of science, and I have thought it right to make them utter your welcome." Our countryman, Dr. Bromet, is the only representative of England mentioned, and is described as the *president* of the Archæological Society of London. Next week we shall give a few particulars of Tournay and its cathedral.

## RAILWAY STRUGGLES.

SIR,—In No. 122 of your valuable periodical, you allude to the expensive contest now being carried on between the "broad and narrow gauges" and the interest it excites in the Parliamentary Committees and the railway world. Being a looker-on and unconnected with railways, and without entering further into the question of the gauges than to state, that it appears the difference in cost of earthwork between the broad and narrow gauge is 6½ per cent., 7 per cent. land, with a larger expenditure in bridges, carriages, &c., and an additional expense in the upper works to carry the heavier locomotives, &c., as well as extra lines of rails to suit the traffic of the narrow gauge, it appears to me that the difference of the cost of construction would amount to at least from 20 to 25 per cent. in favour of the narrow gauge. With reference to speed, the express trains on the London and Birmingham Railway exceed one mile per minute, and it has been stated with regard to the power of draught, that ninety-five waggons in one train, each containing seven tons, have been conveyed on the narrow gauge, and I have yet to learn the superiority of the broad gauge, or that more has been accomplished by it. It appears to me, Mr. Editor, that the Government and the legislature are exceedingly culpable in looking on with apathy and indifference, while thousands are squandered in these fruitless contests, and although a department of the Board of Trade was obviously appointed to investigate the merits of the various lines of railway before being submitted to Parliament and to report thereon, opposition seems to be carried on to a greater extent and with greater virulence than before. The appointment of the Railway Department of the Board of Trade has not, I conceive, effected the purpose contemplated, for the old channel is still open to railway promotion, with all its expensive paraphernalia; and bills pass through or are rejected by the parliamentary committees, notwithstanding the reports of the Railway Department of the Board of Trade being in favour of or against them. It evidently has been no check either upon reckless speculation or inveterate opposition. The reports of the Railway Department of the Board of Trade, although very able documents, were in general unfavourable to those lines that would compete with existing lines of railway, so that in many instances important places would be connected with rather circuitous routes; certainly the great speed attained on railways has in a measure almost annihilated space, but still I very much question the policy recommended in preferring such routes, at an additional expense to the traveller, when direct ones can be obtained, merely to uphold monopoly, nor do I believe from the spirit of the age the public would long submit to any such arrangements. Railway companies with little delicacy deprived turnpike roads and canals of the whole, or at least, a great portion of their traffic, and now if the public interest require it, they cannot complain of a little fair competition in their own way. The Romans in laying out their roads adopted a straight line between termini without reference to intermediate obstacles, and our own engineers in setting out canals and turnpike-roads, secured the most direct route the nature of the country would admit of, and even important alterations and improvements have been made to shorten the distance between places of considerable traffic. So I suppose the improvement of railways will be left to the next generation, who, enlightened by our errors, will perfect the system we so erroneously and injudiciously began. Again, the most approved system for working railways seems to be very imperfectly understood, some eminent engineers advocating the locomotive, others the atmospheric system (amongst the former are the Stephensons, Macneill, and others; the latter Brunel, Cubitt, and others), and each party asserting the superiority of its own hobby; but in the present state of the question the public at large are incompetent to form an opinion. As the present time would be a good opportunity of investigating the merits of the rival systems of propulsion, as well as that of the gauge, the construction of railways, their upper works, &c., I would suggest the propriety of a commission being appointed, with adequate powers to collect evidence or conduct experiments, composed of eminent men possessed of great scientific attainments and extensive experience, who would be qualified by an intimate knowledge of the subjects at issue, to grapple with them in all their different and difficult bearings.

I am aware that implicit dependance is not to be placed upon the opinions of our engineers, as they are not infallible (besides many of them, like those in other professions, do that they are required to do and are paid for doing); and, as a proof of what I state, at the completion of the Liverpool and Manchester Railway, fifteen miles per hour was considered by engineers to be the maximum speed for a locomotive engine and train, the gradients worked successfully now were considered to be impracticable then, as were other points that are now estabished, which would extend this communication to too great a length for the columns of your journal.

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I am, Sir, &c., B. B.

Brecon, South Wales, June 16, 1845.

## NEW CHURCH, NEAR RAMSGATE.

TRINITY Church, Mount Albion, St. Lawrence, near Ramsgate, was consecrated on Wednesday, June 11, by the Archbishop of Canterbury, who arrived at eleven o'clock, and was received by about 20 clergy, the committee, trustees, and churchwardens. After the service a capital cold collation was laid at the vicar's, where 40 clergy and others met the Archbishop, who looked well, and commended the church and its promoters. Flags were flying at St. Lawrence, and triumphal arches erected. The church is in the perpendicular style (the style of the fifteenth century), and will accommodate 770 persons. It is 75 feet 6 inches long, and 52 feet 6 inches broad internally, and is divided into naves and aisles by octagon pillars, carrying a clerestroy. The ceilings are all boarded and open. The pewing and free-seats, uniform, low, not painted, but varnished. There is a four-light painted-glass window to the chancel, with figures of St. Mathew, Mark, Luke, and John, paid for by subscription; and a two-light window presented by Mr. W. E. Smith, the builder of the church, at the east end of the south aisle, both made by Warrington, of London.

The building is faced with flints, with freestone quoins. The cost of the whole, including all expenses, was under 3,000*l.*, being less than the architect's estimate; of this about 1,600*l.* only has been raised, for the rest the promoters are responsible. The ground was presented by Mdlle. D'Este. The architects are Messrs. Stevens and Alexander, of London.

GLASS ROOFING.—We learn from the newspapers that within the last few days a rather novel importation has been made in the port of London. This is a small quantity of glass tiles, similar in point of form to the common clay tile for roofing buildings, the advantage held out being their lightness, and being pervious to the rays of the sun. The latter quality is presumed to render them suitable for the roofs of greenhouses, as they will not interrupt the heat and light, whilst they are sufficiently strong to resist the effects of hail-storms, which will much reduce the cost of insurance on greenhouses, &c. The importation is made from Antwerp, and they are chargeable with a duty of 14s. per cwt. under the present tariff. They have the appearance of the common green glass, and if the experiment is found to succeed, it demands the immediate attention of our home manufacturers. We shall be glad to learn where these glass tiles can be obtained.

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The St. James's Bazaar, which "in its time plays many parts," contains at this moment a fine model of

—— "the dome,—the vast and wondrous dome,
To which Diana's marvel was a cell;"

It is made in wood by Mr. Drake, of very large size, and is well worthy of examination. It was the work of seven years, and must have required a stock of patience, as well as skill, larger than is usually possessed. In the anteroom is exhibited a very good panorama of Rome, "the city of the soul,"—the "lone mother of dead empires," which will serve to prepare a traveller for the disappointment which is usually experienced on first entering the eternal city.

"The goth, the Christian, time, war, flood, and fire,
Have dealt upon the seven-hilled city's pride;
She saw her glories star by star expire,
And up the steep barbarian monarchs ride,
Where the car climb'd the capitol; far and wide
Temple and tower went down, nor left a site:
Chaos of ruins! who shall trace the void,
O'er the dim fragments cast a lunar light,
And say, 'here was, or is,' where all is doubly night?"

In addition to the model and view, there are some original sketches by Michael Angelo, Sangallo, Bramante, and other architects connected with the building, and which, though slight, are very interesting.

## APPLICATION OF DIFFERENT STYLES OF GOTHIC ARCHITECTURE.

Sir,—My attention was attracted last week to a paper in your magazine bearing the signature E. H., and to a remark met there, to the intent that the architects of the present day were expected to study the example of the middle ages, and to design their works in accordance with the true spirit of that remarkable period of barbarism and refinement. I do not quote *verbatim*, but I believe that my impression as to sense is correct. To do this, it is well said that we must visit the objects themselves, and there learn to feel the beauty of the styles we intend to design in.

This seems, indeed, to be an age of adaptation,—the solemn character of the Egyptian, the grace and beauty of the Grecian, Roman, Goth, and Middle Age are united in one age. But I have often thought that there is one circumstance which adds considerably to the striking effect of some of our finest old English structures, which is, that all improvements or additions were made in the prevailing fashion of the time. The diversity thus occasioned has often furnished a theme for admiration: Early English, Decorated, or Perpendicular arches were inserted in Norman walls, and it very frequently happens, that the old Norman doorway is the only relic left of the original church.

This circumstance has been of great use to the antiquary, who builds his era on the fashion of carvings, mouldings, and forms of arch and tracery. But returning to the idea of the beauty of non-uniformity, let us take, for instance, a large church with transepts,—the chancel and choir Perpendicular or Decorated, the transepts and centre tower semi-Norman or Early English, and the nave Norman. Other combinations may of course be chosen, but I think that a union of styles would give more of the correct feeling of the middle ages than to carry out our large works as all of one period.

Viewing such a church as suggested from the nave, we have a bold foreground, the vista gradually becoming more adorned till, at the eastern end, the beauty is complete; then stained glass and rich decoration should finish the picture, and satisfy the eye.

The arrangement just contemplated will be found in some of our finest cathedrals,—Durham in a degree, Lincoln better, and others might be named, perhaps, where the feeling is more fully expressed.

It has been said that invention in architecture has ended, that we can but copy now. Whether the elements of design are exhausted or not, there seems to be a general feeling against every thing new in architectural design; and unless we have a precedent for what we do, it is not correct and does not please. In the other branches of the arts we are progressing; but perhaps it may even be impossible to catch the genius of the early world, when man had every thing to design, and revelled in the luxury of an open and untrodden field. Now we are told of every suggested idea, "Why that is as old as the hills." The rail appears the only road to favour at present.

C. M. J.

## Correspondence.

### ST. MARY'S NOTTINGHAM.

Sir,—Doubtless for some years past you have heard of the contemplated restoration of this magnificent pile, and, unfortunately, it has only been hearsay, for nothing has been done. You will also probably recollect that about four months ago tenders were publicly advertised for, and there was every prospect of the building proceeding under the able hands of Mr. Cottingham. Thus far all the world has heard, but in this, as in many other cases, more remains to be told. Here is another instance of an unrestricted competition, and I am afraid it will end in another failure. I believe four tenders were delivered; three were very close together, about 5,000*l.*, and very near the architect's estimate, the fourth was 2,400*l.*! By begging and praying, the builder who named that sum obtained leave from the committee to amend his estimate, and went through it with the clerk of works to see what was absolutely left out, and then sent it in at 2,800*l.*, which the committee allowed. Mr. Cottingham, as a matter of course, disliked having his designs murdered by such a tender, believing the works could never be done for the money; so of course he objected to it, and therefore the committee discharged him; and this *protégé* of theirs is to carry out the works, while Messrs. Scott and Moffatt are to step into Mr. Cottingham's shoes.

I have, I fear, already trespassed too much on your patience, and will merely subscribe myself,

An Uninterested Party, but a Lover of Justice.

Nottingham.

### PURIFICATION OF WATER.

Sir,—I am much annoyed with the water I raise from a well in which is fixed a vast iron pump; the soil or bottom of the well is composed of gravel, and so is that of the whole neighbourhood.

The water is hard, but what I chiefly suffer from, is the water that is pumped at night being of a *red* or *rusty* colour, the next morning with a strong metallic smell, and a coating of a metallic substance on the surface of the water.

The kindness of a suggestion to remove this evil from any of your subscribers, will be highly esteemed by Yours, &c.

Exeter, June 17th A. X. Y.

## Miscellanea.

Cannel Coal.—It is not generally known that Cannel coal can be employed in the fine arts, and that for the bases of statues, plinths, and a variety of other purposes, for which black marble and other fossil substances are used, this fossil can be substituted at a less cost and with less difficulty in the cutting or carving. A very elegant vase of this material, something in the shape of the well-known Warwick vase, but flatter and partaking more of the patera shape, has been lately cut out of a block of Cannel coal, or rather "turned" out of the block by means of the lathe. The artist is a Mr. J. Dallaway. The vase stands on a fluted column of the same material. It has, we believe, been shown to his Royal Highness Prince Albert, who has expressed his satisfaction, both with the design and the workmanship of the artist. The polish that the material of which it is composed receives with very little labour, is surprising. The block came from the estate of the Duke of Norfolk, near Sheffield.

The New Paddington Hospital.—His Royal Highness Prince Albert will lay the foundation of the new hospital at Paddington on Saturday, the 28th instant, at three o'clock in the afternoon. Mr. Hopper is the architect. We understand the choice wavered for some time between that gentleman, Mr. French, and Mr. Alfred Lang.

Bristol and Clifton Drainage.—The local papers say the Report of the Government Commissioners on this most important subject has aroused the inhabitants to form a Drainage Company. Clifton was gradually being ruined by the abominable cesspools made around the houses; and from the strata of the rocks, it is proved that all the wells are, more or less, affected by the overflowing of these cesspools! The calculations shew that for a small sum from each house (one quarter the expense of emptying the cesspools) a per centage exceeding 10*l.* per cent. will be realized.

New Church at Hull.—A meeting of the subscribers to the Hull Church Building Fund was held last week to decide on the best plan for the proposed new church to be dedicated to St. Paul, when that of Mr. William Hey Dikes, jun., was selected from a great number that had been sent in and exhibited in the large room of the dispensary three weeks prior to the meeting. The church is designed to seat 1,200 persons, without galleries, and the walls are to be entirely of stone, without plaster. Mr. Dikes, we believe, is a native of Hull, but at present located at Wakefield.

Fall of a Floor in a Mill.—A few days since, soon after the commencement of a sale by auction in Dean Mill, Yeadon, near Leeds, the second floor on which the company were assembled gave way, and upwards of 50 persons were precipitated into the room below along with a great quantity of wood, machinery, and other weighty property. There were upwards of 100 persons in the room when the accident occurred, yet, astonishing to say, not a limb was broken, nor any one seriously injured.

Foul Air in Wells and Cesspools.—Mr. Green, of Sudbury, has been rewarded by the Society of Arts and Sciences for a method of purifying wells, &c., from the foul air which so often accumulates in them when long closed, and has not unfrequently been destructive of life. The plan is simply to throw into the well a quantity of unslacked lime, which, as soon as it comes in contact with the water, throws up a column of vapour, driving before it all the deleterious gases, and rendering it perfectly safe for the workmen to descend immediately.

Testimony of Respect to Mr. John Gray, Civil Engineer.—This gentleman, who has been the resident engineer of the Hull and Selby Railway ever since the completion of the line, had last week presented to him by upwards of 150 mechanics and workmen under his superintendence, an elegant silver tea and coffee service, on the occasion of his resigning his appointment for a more lucrative one on the London and Brighton line.

## NOTICES OF CONTRACTS.

[We are compelled by the interference of the Stamp Office to omit the names of the parties to whom tenders, &c., are to be addressed. For the convenience of our readers however, they are entered in a book, and may be seen on application at the office of "The Builder," 2, York-street, Covent-garden.]

For executing Works on the Leeds, Dewsbury, and Manchester Railway, being a distance of about 4¼ miles. The principal work on this division is the summit Tunnel, near Morley, which is upwards of 3,000 yards in length.

For the execution of a New Harbour at Greenock.

For the construction of Two Divisions of the Chester and Holyhead Railway, being Nos. 8 and 12. No. 8 contains a length of 7 miles and 54 chains. No. 12 contains a length of 5 miles and 26 chains.

For the erection of a Governor's House, and alterations of the Chapel, at the Worcester County Gaol.

For supplying the St. Marylebone Vestry, with materials for keeping the Foot-way and Carriage-way in order.

For the several works contingent on Warming and Ventilating the Chester Castle County Gaol.

For excavating and levelling Land, building Sewers, making a new Road, &c., on the Wheatley Estate, Erith, Kent.

For Bricklayers', Carpenters', Smiths', Plumbers', Painters' and Glaizers' Works, required to be done for one year, from the 24th inst., at the Churches, Chapels, Court-house, &c., of the Parish of St. Marylebone.

For lowering and making certain Improvements at the Yeuston Hill, Henstridge, Somerset.

For laying down a short Line of Railway, upon Pilbrow's Atmospheric principle, and for two Cornish Engines.

and if adhered to, nothing need be apprehended. I could instance several suspension bridges that have stood many years in this country without injury, whose limits of elasticity do not exceed 30 lbs. per square foot, whilst at any time they are liable to be loaded to 70 lbs., which they may bear once or twice, but it would permanently cripple and weaken the structure, and repeated loading eventually destroy it. I must also differ from you in supposing that a suspension is more liable suddenly to give way than a compression bridge; in proof of the contrary I will instance the fall of the bridge across the Mill Fleam, at Derby, those at Ashton-under-Lyne, and several others that have occurred lately by which lives have been lost. The fact is, the erroneous principles upon which both suspension and compression bridges are constructed of necessity compel their failure directly any part, however trivial, yields. This for several years I have been trying to impress upon the public, and have at last succeeded. And though there are still many persons who object to my plan, yet I am happy to know that eventually they must acknowledge it to be correct." For upon what natural principle can it be argued that the failure of a single part, however trivial in itself, should destroy the whole.

It is impossible but that some parts must be weaker than others, and the weakest part will always be proportionably most strained, and should at any time the pressure on these parts exceed the limits of elasticity, it yields, and the bridge fails also. What argument then can be brought forward to support a principle that reduces the strength of the whole to that of the weakest part. And I tell the mathematicians (for as I know something of that science, without presumption may I tell them so) that the principle is wrong—and not all the reasoning in the world can make it right—and that a bridge should no more be destroyed by the failure of a single part than a limb of a tree should fall down by lopping off a part from it; the fractured end in both instances would fail, but the rest should remain as firm as ever.

I am, Sir, &c.,

Bath, June 16th. JAMES DREDGE.

N.B. The Montrose Bridge did not fall at the opening, but a long time afterwards at the time of a boat-race. J. D.

*** We have inserted Mr. Dredge's letter, notwithstanding that a threat of an action for libel if we did *not* do so accompanied it, and had nearly led us to adopt a contrary course.

## SIZE OF MAIN DRAINS UNDER BUILDINGS ACT.

SIR,—I am at a loss to know what size to make the main drain for carrying off soil. In the Act it mentions, that it must be in transverse section at least equal to a circular area of 9 inches diameter. Now, as I am not sufficiently competent to understand such ambiguity, will you, in your next number, make the point clear, for I find many other persons puzzled equally as much as your humble servant, A BRICKLAYER.

*** We wish no part of the Act was more ambiguous than the clause quoted. A 9-inch barrel drain (or larger) may be used, or a drain of any other shape provided it afford water-way (area) equal to a 9-inch barrel drain. The area of the latter is 5 inches and 3 parts, so that, for the sake of example, a rectangular drain not less than 9 inches by 7 inches may be used, or one 12 inches by 5¼ inches, since the area of either of these is equal to that required.

ARCHÆOLOGICAL CONGRESS AT LILLE.—Members of the French Archæological Congress held at Lille, visited Tournay on the 8th inst., and examined all the antiquities of that very interesting town. They were received with extraordinary demonstrations of respect even to the ringing of the great bells of the cathedral. Relative to this, the bishop of Tournay who received the congress in the episcopal palace said, "The bells you hear gentlemen, sound but for God and our princes: you are the princes of science, and I have thought it right to make them utter your welcome." Our countryman, Dr. Bromet, is the only representative of England mentioned, and is described as the *president* of the Archæological Society of London. Next week we shall give a few particulars of Tournay and its cathedral.

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Sir,—My attention was attracted last week to a paper in your magazine bearing the signature E. H., and to a remark met there, to the intent that the architects of the present day were expected to study the example of the middle ages, and to design their works in accordance with the true spirit of that remarkable period of barbarism and refinement. I do not quote *verbatim*, but I believe that my impression as to sense is correct. To do this, it is well said that we must visit the objects themselves, and there learn to feel the beauty of the styles we intend to design in.

This seems, indeed, to be an age of adaptation,—the solemn character of the Egyptian, the grace and beauty of the Grecian, Roman, Goth, and Middle Age are united in one age. But I have often thought that there is one circumstance which adds considerably to the striking effect of some of our finest old English structures, which is, that all improvements or additions were made in the prevailing fashion of the time. The diversity thus occasioned has often furnished a theme for admiration: Early English, Decorated, or Perpendicular arches were inserted in Norman walls, and it very frequently happens, that the old Norman doorway is the only relic left of the original church.

This circumstance has been of great use to the antiquary, who builds his era on the fashion of carvings, mouldings, and forms of arch and tracery. But returning to the idea of the beauty of non-uniformity, let us take, for instance, a large church with transepts,—the chancel and choir Perpendicular or Decorated, the transepts and centre tower semi-Norman or Early English, and the nave Norman. Other combinations may of course be chosen, but I think that a union of styles would give more of the correct feeling of the middle ages than to carry out our large works as all of one period.

Viewing such a church as suggested from the nave, we have a bold foreground, the vista gradually becoming more adorned till, at the eastern end, the beauty is complete; then stained glass and rich decoration should finish the picture, and satisfy the eye.

The arrangement just contemplated will be found in some of our finest cathedrals,—Durham in a degree, Lincoln better, and others might be named, perhaps, where the feeling is more fully expressed.

It has been said that invention in architecture has ended, that we can but copy now. Whether the elements of design are exhausted or not, there seems to be a general feeling against every thing new in architectural design; and unless we have a precedent for what we do, it is not correct and does not please. In the other branches of the arts we are progressing; but perhaps it may even be impossible to catch the genius of the early world, when man had every thing to design, and revelled in the luxury of an open and untrodden field. Now we are told of every suggested idea, "Why that is as old as the hills." The rail appears the only road to favour at present.

C. M. J.

## Correspondence.

### ST. MARY'S NOTTINGHAM.

Sir,—Doubtless for some years past you have heard of the contemplated restoration of this magnificent pile, and, unfortunately, it has only been hearsay, for nothing has been done. You will also probably recollect that about four months ago tenders were publicly advertised for, and there was every prospect of the building proceeding under the able hands of Mr. Cottingham. Thus far all the world has heard, but in this, as in many other cases, more remains to be told. Here is another instance of an unrestricted competition, and I am afraid it will end in another failure. I believe four tenders were delivered; three were very close together, about 5,000*l.*, and very near the architect's estimate, the fourth was 2,400*l.*! By begging and praying, the builder who named that sum obtained leave from the committee to amend his estimate, and went through it with the clerk of works to see what was absolutely left out, and then sent it in at 2,800*l.*, which the committee allowed. Mr. Cottingham, as a matter of course, disliked having his designs murdered by such a tender, believing the works could never be done for the money; so of course he objected to it, and therefore the committee discharged him; and this *protégé* of theirs is to carry out the works, while Messrs. Scott and Moffatt are to step into Mr. Cottingham's shoes.

I have, I fear, already trespassed too much on your patience, and will merely subscribe myself,

An Uninterested Party, but a Lover of Justice.

Nottingham.

### PURIFICATION OF WATER.

Sir,—I am much annoyed with the water I raise from a well in which is fixed a vast iron pump; the soil or bottom of the well is composed of gravel, and so is that of the whole neighbourhood.

The water is hard, but what I chiefly suffer from, is the water that is pumped at night being of a *red* or *rusty* colour, the next morning with a strong metallic smell, and a coating of a metallic substance on the surface of the water.

The kindness of a suggestion to remove this evil from any of your subscribers, will be highly esteemed by Yours, &c.

Exeter, June 17th A. X. Y.

## Miscellanea.

Cannel Coal.—It is not generally known that Cannel coal can be employed in the fine arts, and that for the bases of statues, plinths, and a variety of other purposes, for which black marble and other fossil substances are used, this fossil can be substituted at a less cost and with less difficulty in the cutting or carving. A very elegant vase of this material, something in the shape of the well-known Warwick vase, but flatter and partaking more of the patera shape, has been lately cut out of a block of Cannel coal, or rather "turned" out of the block by means of the lathe. The artist is a Mr. J. Dallaway. The vase stands on a fluted column of the same material. It has, we believe, been shown to his Royal Highness Prince Albert, who has expressed his satisfaction, both with the design and the workmanship of the artist. The polish that the material of which it is composed receives with very little labour, is surprising. The block came from the estate of the Duke of Norfolk, near Sheffield.

The New Paddington Hospital.—His Royal Highness Prince Albert will lay the foundation of the new hospital at Paddington on Saturday, the 28th instant, at three o'clock in the afternoon. Mr. Hopper is the architect. We understand the choice wavered for some time between that gentleman, Mr. French, and Mr. Alfred Lang.

Bristol and Clifton Drainage.—The local papers say the Report of the Government Commissioners on this most important subject has aroused the inhabitants to form a Drainage Company. Clifton was gradually being ruined by the abominable cesspools made around the houses; and from the strata of the rocks, it is proved that all the wells are, more or less, affected by the overflowing of these cesspools! The calculations shew that for a small sum from each house (one quarter the expense of emptying the cesspools) a per centage exceeding 10*l.* per cent. will be realized.

New Church at Hull.—A meeting of the subscribers to the Hull Church Building Fund was held last week to decide on the best plan for the proposed new church to be dedicated to St. Paul, when that of Mr. William Hey Dikes, jun., was selected from a great number that had been sent in and exhibited in the large room of the dispensary three weeks prior to the meeting. The church is designed to seat 1,200 persons, without galleries, and the walls are to be entirely of stone, without plaster. Mr. Dikes, we believe, is a native of Hull, but at present located at Wakefield.

Fall of a Floor in a Mill.—A few days since, soon after the commencement of a sale by auction in Dean Mill, Yeadon, near Leeds, the second floor on which the company were assembled gave way, and upwards of 50 persons were precipitated into the room below along with a great quantity of wood, machinery, and other weighty property. There were upwards of 100 persons in the room when the accident occurred, yet, astonishing to say, not a limb was broken, nor any one seriously injured.

Foul Air in Wells and Cesspools.—Mr. Green, of Sudbury, has been rewarded by the Society of Arts and Sciences for a method of purifying wells, &c., from the foul air which so often accumulates in them when long closed, and has not unfrequently been destructive of life. The plan is simply to throw into the well a quantity of unslacked lime, which, as soon as it comes in contact with the water, throws up a column of vapour, driving before it all the deleterious gases, and rendering it perfectly safe for the workmen to descend immediately.

Testimony of Respect to Mr. John Gray, Civil Engineer.—This gentleman, who has been the resident engineer of the Hull and Selby Railway ever since the completion of the line, had last week presented to him by upwards of 150 mechanics and workmen under his superintendence, an elegant silver tea and coffee service, on the occasion of his resigning his appointment for a more lucrative one on the London and Brighton line.

### NOTICES OF CONTRACTS.

[We are compelled by the interference of the Stamp Office to omit the names of the parties to whom tenders, &c., are to be addressed. For the convenience of our readers however, they are entered in a book, and may be seen on application at the office of "The Builder," 2, York-street, Covent-garden.]

For executing Works on the Leeds, Dewsbury, and Manchester Railway, being a distance of about 4¼ miles. The principal work on this division is the summit Tunnel, near Morley, which is upwards of 3,000 yards in length.

For the execution of a New Harbour at Greenock.

For the construction of Two Divisions of the Chester and Holyhead Railway, being Nos. 8 and 12. No. 8 contains a length of 7 miles and 54 chains. No. 12 contains a length of 5 miles and 26 chains.

For the erection of a Governor's House, and alterations of the Chapel, at the Worcester County Gaol.

For supplying the St. Marylebone Vestry, with materials for keeping the Foot-way and Carriage-way in order.

For the several works contingent on Warming and Ventilating the Chester Castle County Gaol.

For excavating and levelling Land, building Sewers, making a new Road, &c., on the Wheatley Estate, Erith, Kent.

For Bricklayers', Carpenters', Smiths', Plumbers', Painters' and Glaizers' Works, required to be done for one year, from the 24th inst., at the Churches, Chapels, Court-house, &c., of the Parish of St. Marylebone.

For lowering and making certain Improvements at the Yeuston Hill, Henstridge, Somerset.

For laying down a short Line of Railway, upon Pilbrow's Atmospheric principle, and for two Cornish Engines.

For Plumbers' and Glaziers' Works, at the Hackney Union Workhouse, for one year, from the 24th inst.

For Building a New Parsonage House, at Castle Cary, Somerset.

For the Removal of several Wrecks in the Thames.

For Excavating and Carting away the Soil and Rubbish, and making a Brick Barrel Culvert in Coventry.

For the Erection of a Dwelling House, Offices, and Farm Buildings at Bourton, near the Shrivenoam Station, Berks.

For Repairing the Roofs of the Union Workhouse and Offices at Thornbury, and for the Painting, Colouring, and Whitewashing the Exterior and Interior Walls, Wood-work, Railings, &c., of the same building.

For the Erection of Schools, and Teachers' Residences, for the Trustees of the Worfield Charity, near Wolverhampton.

For the Erection of a New Church in the parish of Whitechapel.

For the Erection of Schools and a Teacher's Residence in connection with the new church of St. Jude, Whitechapel.

For the Repairs to the South Aisle, Roof, &c., of St. James's Church, Bury, St. Edmunds.

For the Erection of New Schools at Great Chesterford, Essex.

For 200 tons of New Iron Butt and Plate Hoops, and for 40 mille great tale of Baltic and Quebec Pipe Staves.

For the Erection of a New Church at Homerton.

For a Footway Paving to be laid down in the Parish of St. Paul's, Deptford.

For re-building a certain Bridge called Roache's Bridge, in the parish of Fordingbridge, in the County of Southampton.

For repairing and improving Horrington Bridge, in the parish of Arreton, in the Isle of Wight.

For re-building Alverstone Bridge, in the parish of Brading, in the Isle of Wight.

For repairing Langbridge, in the parish of Newchurch, in the Isle of Wight.

## COMPETITIONS.

Designs for houses to be erected at Dover. The ground is nearly seven acres in extent, and lies on a gentle slope between the south-west boundary of Dover Castle and the town. A premium of fifty guineas is offered for the set that may be most approved of.

## APPROACHING SALES OF WOOD, &c.

BY AUCTION.

The timber and other trees now standing upon the estate at Woodseaves, Salop. By order of the Lord Chancellor made in the cause "Dickin *v.* Barker."

In the parishes of Terling and Fairsted, Essex: 215 Capital Oak, and 11 Ash Timber Treses, many of them of large dimensions.

At the George Inn, Rowde, Wiltshire: 108 Elm Timber Trees, and 58 Oak ditto. They are of good and some of large dimensions.

At Beale's Farm, near Badley Hall, Ardleigh, Essex: 130 Oak Timber Trees of good dimensions, and 3080 Bavins.

At Norton Hall, and Purleigh Round Bush Farms, Essex: an assortment of Oak, Ash, and Elm Timbers and Whips.

At Mrs. Burchell's Farm, Little London, Woodham Walters, Essex: 130 Oak, Ash, and Elm Timber Trees.

BY TENDER.

A Virgin Forest of Valuable Timber in Walachia. The principal part of the Trees is Oak. The said Forest may produce about 500,000 cubic feet of Timber.

At Little Bentley Hall, Essex: several Acres of Plantations, consisting of superior Firs, Larch, Spruce, &c., to be taken down by the Purchaser.

## MEETINGS OF SCIENTIFIC BODIES

*During the ensuing week.*

MONDAY, June 23.—*Geographical*, 3, Waterloo-place, 8½ P.M.; *British Architects*, 16, Grosvenor-street, 8 P.M.

TUESDAY, 24.—*Medical and Chirurgical*, 53, Berners'-street, 8½ P.M.; *Civil Engineers*, 25, Great George-street, 8 P.M.; *Zoological*, Hanover-square, 8½ P.M.

WEDNESDAY, 25.—*Geological*, Somerset-house, 8½ P.M.; *Pharmaceutical*, 17, Bloomsbury-square, 9 P.M.

THURSDAY, 26. — *Royal Society of Literature*, 4, St. Martin's-place, 4 P.M.; *Medico-Botanical*, 72, Sackville-street, 8 P.M

FRIDAY, 37. — *Philological*, 49, Pall Mall, 8 P.M.

SATURDAY, 28.—*Royal Botanic*, Regent's-park, 4 P.M.

## TO CORRESPONDENTS.

"Prevention of Fire."—*C. W. remarks that the balusters of a staircase when of wood greatly assist the progress of fire, and urges that iron should be used instead. The importance of having a staircase wholly incombustible cannot be over-rated. Wooden staircases seem specially contrived to spread a fire when it does happen, from the bottom of the house to the top.*

"P. A. T. H."—*The letter alluded to, referring to fire-proof staircases, has not reached us. We never omit to acknowledge communications. Perhaps our correspondent will favour us with a copy of it.*

"Prudence."—*The British Mutual Life Assurance Office is in Bridge-street, Blackfriars.*

"A Constant Reader" *would be obliged by being informed through the correspondents of* THE BUILDER *the best and most durable polish for slate, and mode of application.*

"Curves."—*In Mr. Jopling's communication on this subject, last week, after the word "hyperbola," for "archoids" and "cypoids," read, "the cardioids, the conchoids, the cyssoids." The Decorative Art Society should solicit our able correspondent to explain his system at one of their meetings.*

"M. C. C."—*It would be invidious to mention one foundry where castings are not removed red-hot from the sand, as we hope the contrary practice, very properly reprobated in the report from Sir Henry de la Beche and Mr. Cubitt, is the exception rather than the general rule.*

"J. D. Wyatt."—*We shall be glad to receive occasionally a notice of proceedings at the ordinary meetings.*

"F. T."—*The latter paper mentioned by our correspondent would be more likely to meet our views at this moment than the former, as we have already had occasion to refer to the Minster in our pages several times, and must do so again.*

"B. B., a Reader."—*Weale has published a work which gives the information sought, as to taking out quantities, &c.*

"A Mason," *wishes to know where Dr. Reed's ventilator for bed-rooms can be obtained. We think our correspondent errs in the name.*

"W. J. S."—*A letter was left for him at the office as requested. It will apply to* next *Thursday, if considered desirable.*

"D. D."—*The question he asks, namely, "which of the numerous cements now in use is the best," is put to us nearly every week. Our experience of all is not equal, and we might do injustice therefore if we replied.*

"J. K."—*We fear our correspondent's theory is not tenable: we will, however, give it further consideration.*

"E. J. N. S."—*We have thought it necessary to keep back the sketch until we can compare it with the front, and cannot yet promise to engrave it. If our correspondent desires to have it, it shall be left for him. Whether we use it or not, we shall feel obliged to him.*

"J. L." *next week.*

"J. J. B."—*The advertisement was published in our Number for May 17th; we regret it escaped the attention of our correspondent. A paragraph directing notice to the land appeared in the same number, p.* 237.

"A London Subscriber" (Nottingham).—THE BUILDER *is always ready for delivery by eleven or twelve o'clock on Friday: the fault must rest with the news-agent. Hereafter arrangements will be made to ensure even an earlier delivery.*

Received: "*A Subscriber*" (*Brick Niches*).


## ADVERTISEMENTS.

### PUBLICATIONS.

Just published, price 5s., neatly bound in roan, with tuck, gilt edges, and lettered, a Pocket Edition of

A CYCLOPÆDIA of the NEW METROPOLITAN BUILDINGS ACT, together with the Act itself, a Folio Table of the Metropolitan Districts (old and new), a List of the Surveyors, with their Residences and Offices, and a Table of Fees to be paid to the Registrar for services performed.

In the Cyclopædia all the details of the Statute are arranged Alphabetically, so as to be instantly found, and accompanied by extensive references and counter-references to the sections of the Act itself and its minute provisions.

By the late A. BARTHOLOMEW, Esq., F.S.A., Architect, Surveyor of the Hornsey District.

Published at the Office of "The Builder," 2, York-treet, Covent-garden; and to be had of all Booksellers.

PRIZES IMPORTANT TO INVENTORS AND PATENTEES.

A GOLD MEDAL, value 100*l.* and a SILVER MEDAL, value 50*l.*, will be given by Mr. M. JOSCELIN COOKE. The Gold medal for the best Patent, and the Silver medal for the best Design taken out or Registered at the OFFICE for PATENTS and DESIGNS, 20, Half-Moon-street, between the 1st of November, 1844, and the 1st of June, 1846. The Prizes will be awarded by competent judges on the 10th June, 1846. The conditions to be observed, together with instructions, charges, and every information for obtaining Patents in England or Foreign Countries, or Registering Designs, will be forwarded gratis, on application to Mr. M. JOSCELIN COOKE, at the Office for Patents and Registration of Designs, 20, Half-Moon-street, Piccadilly, London.

ATMOSPHERIC RAILWAY, Daily at Work, carrying visiters, at the ROYAL POLYTECHNIC INSTITUTION. This interesting Model is lectured on by Professor Bachhoffner at One o'clock daily; also on the evenings of Wednesdays and Fridays at Eight o'clock, and on the evenings of Mondays, Tuesdays, and Thursdays at Nine o'clock. The working of the Model always follows the Lecture. It is also worked at Four o'clock, and at other convenient times. The other interesting Works and popular Lectures as usual.

Admission, 1s.; Schools, half-price.

TO CONTRACTORS, BUILDERS, MASONS, AND BRICKLAYERS.

JOHN TRICKETT, Agent, 14, FERRY-STREET.—At CLIFF and HUSLER'S Wharf, near the Ferry House, Isle of Dogs, A GOOD STOCK is always on HAND of Yorkshire Landings and Paving of the Best Quality, also Sinks, Steps, Coping, Sawn Robinhood, Parkspring, Greenmoor, and Harehills, and also the same Stone in Block, and a good selection of Portland and Bath Blocks. Cargoes constantly arriving in the River which can deliver alongside any Wharf above or below Bridges. Mr. Cliff's celebrated Fire Bricks and Clay, warranted equal to Stoarbridge, and at considerably less prices. The best Lincolnshire Pan and Plain Tiles, at low prices.—JOHN TRICKETT, AGENT, 14, Ferry-street, Isle of Dogs.

N.B.—A Fly now runs to the Ferry House, near the Wharf, every half hour, from the Limehouse Station, Blackwall Railway.

FOX'S PAPER VARNISH, 6s. 8s. and 12s. per gallon; satin size, 21s. per cwt. Carriage Varnish, 10s. per gallon, warranted to stand for outside work; every description of gilders' and decorators' materials. Burnish gold size, 1s. and 1s. 6d., oil gold size, 3s. and 4s. per lb., warranted; burnishers, pencils, tips; gold, 5s. per 100. Grinders' Colours kept ground; badgers, combs, &c.—At the manufactory, 50, Old Compton-street, Soho. Prices lower than any other house. Strong and clear size always ready. N.B. Country orders attended to with dispatch.

TO ARCHITECTS, ENGINEERS, BUILDERS, AND OTHERS.

A HANDSOME DOUCEUR, or a Regular Commission, will be allowed by the advertiser to any gentleman connected with either private or public works, who would recommend business, contracts, or jobs to an old, extensive, and highly respectable factory in London, capable of executing engineering works to any extent consisting in brass or iron, and machinery of every description; the utmost secrecy may be relied on.—Apply to D. G., care of W. THOMAS, British and Foreign Advertising Agent, 21, Catherine-street, Strand.

IRONMONGERY.

BUILDERS will find it greatly to their advantage to purchase IRONMONGERY of CLUSE and BOSE, 25, CITY ROAD, corner of Tabernacle-row, and near Old-street Road.

*Best Cut Clasp.*

| 3d. | 4d. | 6d. | 8d. | 10d. | 20d. |
|---|---|---|---|---|---|
| 5½d. | 7d. | 9d. | 1s. | 1s. 6d. | 2s. 3d. per 1,000. |

Cast Lath Nails, 12s. 6d. per cwt.; Sash Weights, 7s. 6d. per cwt.; Best Cut Floor Brads, 18s. per cwt; Butt Hinges, 2-inch 1s., 2½-inch 1s. 6d., 3-inch 2s. per doz. pair. ELLIPTIC STOVES with Inside Backs, 3½d. per inch; Registers with Inside Backs, 7d. per inch. Every other description of Ironmongery at prices equally low.

DUTY off WINDOW GLASS.—On April the 6th, Squares stouter and of better make than formerly for Glazing purposes at 6d. per foot.

NURSERYMEN, MARKET GARDENERS, AND OTHERS requiring Small Glass, will find a greater variety of sizes (a large Stock of which is constantly on hand) than is kept by any other house in London, from 4d. per foot. Flattened Sheet, Stained, Fluted, the BIRMINGHAM Sheet Plate (superior in all respects to every other make), and Ornamental Glass of every description. Complete Lists of Glass, Lead, Colours, &c., at ready-money prices, may be had (gratis) on application to R. Cogan, at the Western Glass, Lead, and Colour Warehouse, 5, Princes-street, Leicester-square, London.

SURVEYORS, CONTRACTORS FOR PUBLIC WORKS, and the TRADE generally, sending specifications of quantities required, will receive by return of post an invoice at the very lowest cash prices.

A parcel of very Superior Spruce Oker, suitable for PLASTERERS AND PAINTERS, to be sold at 6s. per cwt.

POLONCEAU'S BITUMEN PAVEMENT for paving Foot walks, Terraces, Garden walks, Stables, Coach Houses, Granaries, Corn Stores, and Salt Warehouses. For the exclusion of Damp and Vermin in Basements it is particularly adapted, and for Roofing Dwelling Houses, Porticos, Balconies, and Sheds.

Price 3s. 6d. per square yard.

BITUMEN for covering the Arches of Bridges, Culverts, &c. &c. on Railways and other places (with instructions for laying it down), may be had at the rate of 45s. per ton, by applying to JOHN PILKINGTON, 15, Wharf-road, City-road.

TO ARCHITECTS.

IN consequence of many complaints having been made to the Company, by Architects, of a spurious material having been used in the execution of Works where the SEYSSEL ASPHALTE had been specified for, the Directors, with a view to ensure the fulfilment of any such specification, have authorized CERTIFICATES to be granted to Builders where the

SEYSSEL ASPHALTE

has been used. For the purpose of securing the use of the Genuine Article, Architects and others are recommended to insert in their specifications the "Seyssel Alphalte, Claridge's Patent," and not merely "Asphalte," or "Bitumen," as in many cases where these terms have been used, gas-tar and other worthless and offensive compositions have been introduced. I. FARRELL, Secretary,

Stangate, near Westminster Seyssel Asphalte Company.

Bridge, Jan., 1845.

Books of Instructions for Use may be had at the Office of "The Builder," and of all Booksellers in Town and Country, price 1s.

*** In proof of the necessity of the above advertisement, it may be mentioned, that it has come to the knowledge of the Directors, that in certain works which have been executed by Messrs. Curtis, builders, of Stratford, a spurious material has been used by them, contrary to the specifications, which expressly mentioned, that "Claridge's Asphalte" was to be used.